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Washington Highlights

Developments in the tidelands controversy were accentuated in recent days by news received from Olympia, Wash. The Attorney General of that state was reported prepared to sue the U. S. Government on behalf of Washington for a clear title to the state's tidelands. It would be one of the few times in history that a state has sued the Federal Government.

City attorneys of Long Beach and Los Angeles in the interest of California tidelands have been here to testify before a joint House-Senate judiciary sub-committee. They told the committee that harbor areas of the two California cities are jeopardized by the Federal claim to offshore tidal lands.

Irving M. Smith, Long Beach City Attorney, disclosed that Long Beach wells had accounted for approximately 68 per cent of the oil produced from submerged properties on the West Coast. He estimated oil revenues occruing to the city since 1939 at more than $31,000,000.

Arthur W. Nordstrom, assistant Los Angeles city attorney, said his city's oil revenues of $2,000,000 were of secondary importance. Harbor developments, however, financed by bond issues totaling $29,800,000 are in jeopardy, he stated.

The two displayed maps and photographs to show U. S. Attorney General Clark has asked the Supreme Court to declare that a large part of the outer harbor of Los Angeles is outside San Pedro Bay and therefore subject to Federal ownership.

The steel industry during 1947 scored its best year since 1944, according to the U. S. Bureau of Mines. Total production is computed at 84,000,000 short tons of ingots and castings, an increase of 26 per cent over 1946. Raw material shortages-chiefly scrap, coke and pig iron-sidetracked 1947 from being a record production year. Iron ore tonnage and pig iron tonnage during the year increased 29 and 33 per cent respectively.

President Truman has signed a bill authorizing another $30,000,000 to carry on the nation's program for development of synthetic liquid fuels for another three years. The fuels are being drawn mainly from coal and oil shale.

One million dollars of the total may go for searching out new methods of wresting more petroleum from depleted or stripper oil fields. The present measure continues the original five-year synthetic fuels program, which also carried a $30,000,000 authorization.

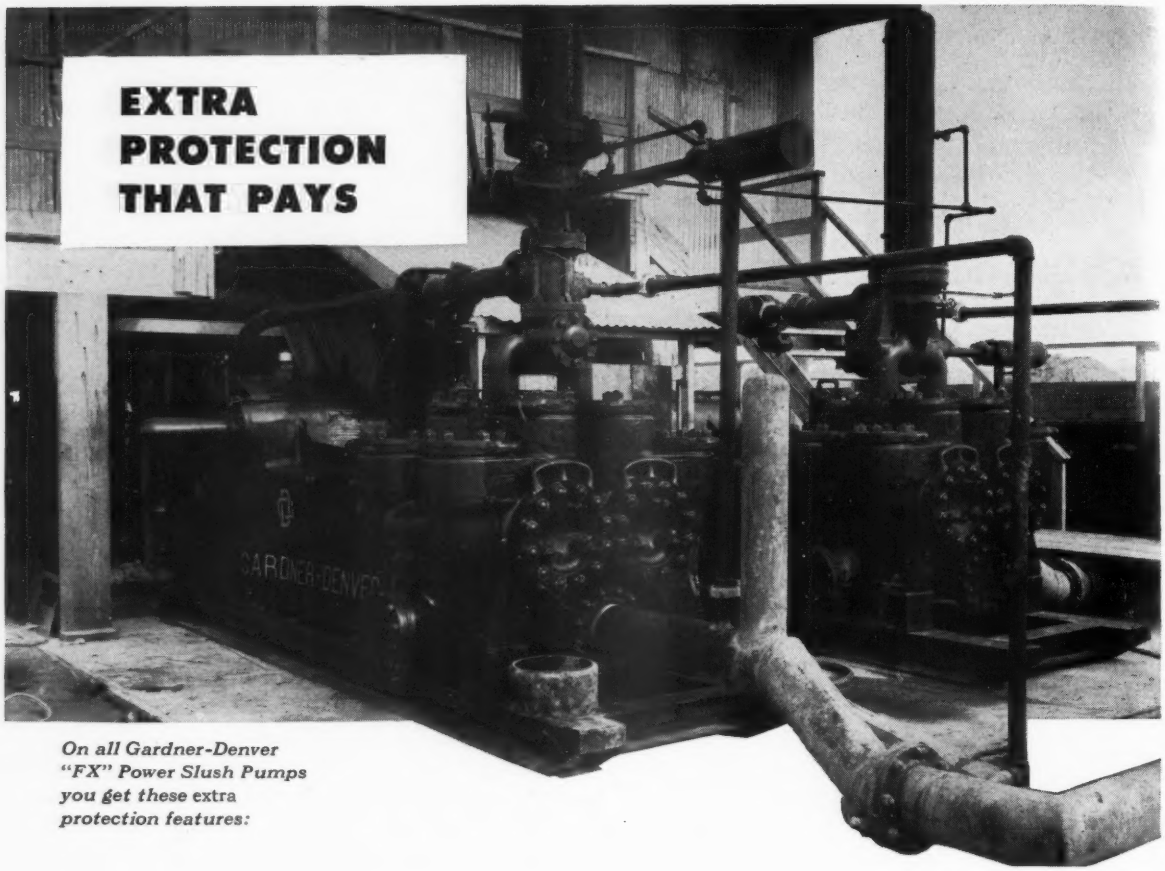
Colorado and Wyoming are important centers of experiments in extracting gasoline from oil shale. A new plant under construction at Louisiana, Mo., to manufacture gasoline from coal is expected to start operations this year.

Commercial production of synthetic fuels from Colorado shale was urged by A. C. Rubel, vice president of Union Oil Co. of Calif. in an appearance before a House sub-committee.

As of March 15, 1948, the Federal Government's budget surplus soared to $5,078,475,494. This was the first time in history that Government income surpassed its spending by $5,000,000,000, even temporarily. The surplus, moreover, is yet only two-thirds as large as the Chief Executive predicts it will be when the fiscal year ends on June 30. A record flow of tax collections is the principal reason for the big surplus.

Washington oil observers found considerable encouragement in an American Petroleum Institute report on the country's petroleum reserves. The report indicated that at the end of 1947, U.S. crude oil reserves totaled 21,487,685,000 barrels. This was a gain of 614,125,000 barrels over the 20,873,560,000 at the close of the previous year.

United States automobile production this year is expected to exceed all previous yearly outputs. Production during 1948 probably will increase 10 to 15 per cent over last year. The industry in 1947 turned out 4,797,000 vehicles, while the all-time record high was 5,358,000 established in 1929.



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A. I. M. M. E. Petroleum Division Holds Successful Annual Meeting

The A.I.M.M.E. Petroleum Division held its Annual Meeting in conjunction with other divisions as participants in the 166th General Meeting of the American Institute of Mining & Metallurgical Engineers, February 15-19, at the Pennsylvania Hotel, New York City. Howard C. Pyle presided as 1947 Division Chairman.

The successful technical session was highlighted by reviews of the foreign oil production situation in twenty-seven countries. Domestic oil production reviews considered every portion of the United States. At the informal Petroleum Dinner, held February 17, Howard C. Pyle presented Certificates of Service to Eugene A. Stephenson and, posthumously, to Fred B. Plummer and Earl Oliver. As after-dinner speaker, J. E. Brantly, president, Drilling & Exploration Co., discussed the "Development of Natural Resources in Foreign Countries." I. W. Alcorm was elected Petroleum Division Chairman for 1948.

H. G. Doll on the Spontaneous Potential Log

A discussion of the theoretical analysis and principles of interpretation of the spontaneous potential log was presented by H. G. Doll. The author showed the spontaneous potential log to be a measurement of the potential drop along the drill hole, caused by the ohmic effect in the mud. The notation of static spontaneous potential was brought forward, and its relation to the spontaneous potential (SP) log discussed. Other factors influencing the shape and amplitude of the log were considered; and attention given to conditions encountered in practice.

The S.P. log, although indicating permeability, is not an absolute measurement of permeability, nor of porosity, of the formations traversed by a drill hole, according to the author. It was stated to be affected by several parameters, such as resistivity of formations and mud, thickness of formations, and others, which should be appraised carefully. Simple rules were described as established for a better distinction of the boundaries of permeable sections, particularly in difficult cases, such as those encountered in highly resistive formations. A systematic application of the established principles, the author said, will assist in obtaining more information from the S.P. log than was possible thus far; for instance, under favorable conditions, the presense of oil may be detected, or the amount of shale in sands may be estimated.

The Technique of S.P. Logging

The recording of S.P. logs is made according to a simple technique. As illustrated in Fig. 1, an electrode M, located at the end of an insulated cable C, is moved up or down in the mud filling the drill hole. The cable passes over a calibrated sheave S, and is wound on a winch W. Contact with the insulated conductor is established

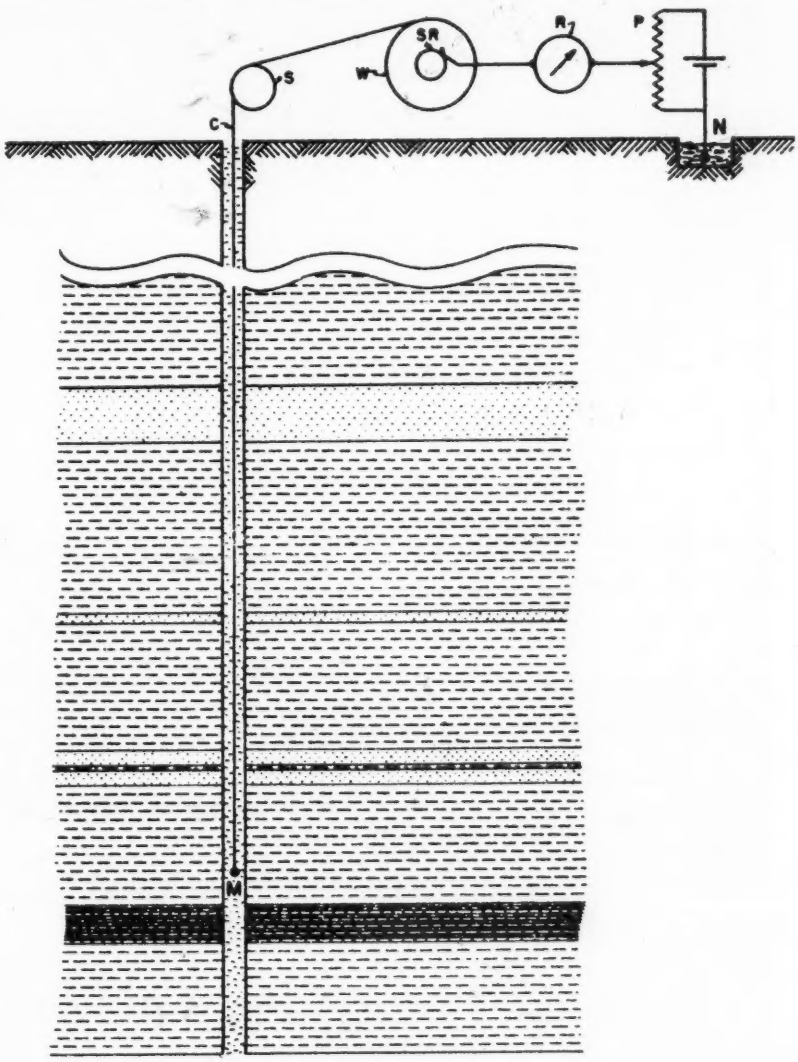

FIG. I

SCHEMATIC CIRCUIT FOR RECORDING S.P. LOGS

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through a slip-ring collector SR, which is connected to one terminal of a recording galvanometer R; the other terminal of the galvanometer is connected to a potentiometric circuit P, and then to an electrode N, usually placed in the mud pit or attached to the casing of the hole.

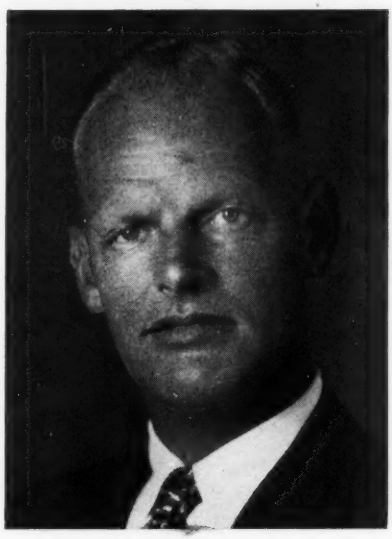
The movement of the sensitive paper or film in the recorder R, is synchronized with the movement of the electrode M along the drill hole. The depth scales used in recording are 1-inch per 100 feet of electrode motion; 2-inches per 100 feet and 5-inches per 100 feet. The recorder registers a log on which the abscissae are proportional to the depth of electrode M, and the ordinates represent the potential of electrode M with reference to electrode N.

The drill holes in which the S.P. logs are recorded are usually filled with mud having a water base. The mud density is such that at each depth the hydrostatic pressure in the hole is greater than in the formations; as a result, the fluid contained in the permeable beds cannot contaminate the mud. Also, the mud is in constant circulation during the drilling operation, prior to the logging, and therefore it is homogeneous.

Nature of the S.P. Current

According to the circuit shown on Fig. 1, it can be seen that the recording galvanometer R measures all the differences of potential appearing between electrodes M and N. However, provided some proper precautions are taken, experience has shown that under usual conditions the deflections on the S.P. log correspond to phenomena occurring at the contacts between the mud and the different beds, and also at the contacts between the beds themselves. These phenomena produce an electric current, called the spontaneous potential current, which uses the mud as its return path. In so doing, it creates in the mud by ohmic effect, potential differences which can be measured and plotted versus corresponding depths, to constitute the S.P. log.

Other sources of potential, which are not related to the formations, do not usually cause any deflection on the S.P. log; if present and both-



Howard Pyle
(Presided at the Petroleum Division Dinner)

ersome, proper steps are taken to overcome them. Particularly, electrodes M and N are chosen to be stable insofar as their contact potential with the mud is concerned; in practice, M and N are lead electrodes. A constant difference of potential may normally appear between these two electrodes, in the absence of any S. P. current. This difference of potential is not recorded on the S.P. log; it is counterbalanced by means of the potentiometric circuit P.

Accordingly, the potential of electrode M is measured on the S.P. log with reference to an arbitrary constant. However, the variations of the potential, i.e., the deflections on the S.P. log, do not depend on the arbitrary constant, and they measure the potential differences as created in the mud by the S.P. current. It is these deflections which make it possible to characterize the formations. Under normal conditions, the excursions toward the negative characterize permeable beds, while excursions toward the positive characterize impervious beds.

Conclusions

The author concluded that the S.P. log is essentially a good detector of permeable beds, which, under normal conditions, correspond to negative peaks. It does not, however, measure the value of the permeability or of the porosity, and in fact makes little differentiation between highly permeable beds and strata whose permeability is too low to be of commercial value.

The boundary between a permeable bed and an impervious bed is described as characterized by an inflection point on the S.P. log. This inflection point does not correspond to half deflection when the resistivities of the two beds in contact are different, or when one of the beds is thin. For the boundary of two thick beds the inflection point is nearer to the plateau corresponding to the more conductive of the two beds.

When permeable beds are bounded by highly resistive formations, as in limestone fields, the corresponding peaks spread appreciably beyond the boundaries. The boundaries cannot anymore be determined with good accuracy without the help of the resistivity log. The permeable beds, however, are characterized on the S.P. log by slope changes, or curvatures, with the convexity toward the negative. Conversely, impervious beds of low resistivity are characterized by slope changes, or curvatures, with the convexity toward the positive. Highly resistive formations correspond to substantially straight parts of the S.P. log.

The S.P. log has a symmetrical nature, it was explained. When the permeable beds are reasonably clean, are of sufficient thickness, and contain the same interstitial water, they furnish a base line which is just as good as the shale line. The total e.m.f. was shown to be represented on the S.P. log by the amplitude recorded on thick sands that are known to be substantially clean, and to contain the same type of interstitial water. When the amplitude on other beds is to be used for analysis, it should not be computed in millivolts, but rather in percentage of the total e.m.f.

Sand Types Estimated

For thin clean sands, the amplitude of the S.P. peaks, although influenced by several additional factors, may be used to get an approximation of the thickness, provided the resistivity of each sand and its adjacent formations are approximately the same, the author said.

Sands containing colloidal material, or sandwiches of thin strata of sand or shale were described as

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behaving as if the e.m.f. involved were a function of the percentage of shale or colloidal material. Other conditions being the same, the apparent e.m.f., also called pseudo-static S.P., decreases where the oil saturation in these sands increases, even though their colloidal content is only a few per cent. Accordingly, in the case of thick beds, the amplitude may be used to indicate approximately the percentage of colloidal material, and to assist in the discrimination between oil bearing and water bearing sections of a shaly sand.

The area under the S.P. log, that is the area between the S.P. log and the base line, may in favorable cases, where the resistivity of the formation is substantially constant, give a useful indication of the respective proportions of permeable and impervious beds in a given interval, the author concluded.

Weinaug and Cordell on Retrograde Condensate

In a paper dealing with the revaporization of retrograde condensate from sand, C. F. Weinaug and J. C. Cordell concluded that the presence of sand aids in maintaining equilibrium conditions during the pressure depletion of a retrograde condensate reservoir by increasing the liquid-vapor interfacial area. Equilibrium is maintained in the presence of sand even at the fast rates of pressure decline usually employed in laboratory studies of these systems. The authors believe that sand-packed cells should be used to determine the retrograde behavior experimentally.

The study of the behavior of gas-condensate types of mixtures was made in the presence and absence of sand in order to determine if the condensate would revaporize in the presence of sand. Methane-butane and methane-pentane mixtures that would form retrograde condensate when produced from a constant-volume cell were used.

The methane-butane mixtures of similar composition were produced by three different methods. The first two were charged into an empty cell and were produced in one case within a period of nine hours; and in the other within a period of three days. The third mixture was charged to a sand-packed cell and

W. R. Wardner, Jr.
(Prepared Production Statistics for 1947)

produced within a period of nine hours. The curves relating composition of the produced gas to pressure obtained from these experiments show that equilibirum was maintained as long as condensate was being formed. However, during the portion of the pressure decline where the condensate should be revaporizing, equilibrium was maintained only when the mixture was produced from the sand-packed cell. The methane-pentane mixture was produced only in the presence of sand. The data obtained for this system also show that equilibrium is maintained at all times during the pressure decline. These results indicate, according to the authors, that revaporization is aided rather than prevented by the fact that the condensate "wets the sand".

W. L. Stanton
(Author of a Review of Washington and Oregon Exploration Activity)

Retrograde Behavior Significant

The significance to the petroleum industry of the behavior of hydrocarbons in the retrograde region is becoming increasingly important because a large percentage of reservoirs being discovered today are of the condensate type. The important characteristic of a gas condensate reservoir is the retrograde condensation of a liquid phase throughout the reservoir if the pressure is allowed to decline. In order to prevent the loss of this retrograde liquid in some of these reservoirs, they are "cycled"; that is, the material produced from the reservoir is processed to remove the heavier hydrocarbons, and the light fractions are returned to the reservoir to maintain the reservoir pressure. Another method of producing these reservoirs is by pressure depletion.

The authors explained that although there are a large number of factors involved in determining the optimum method of producing a reservoir, only the problem of whether the retrograde condensate will revaporize from sand if the pressure was lowered sufficiently was considered in the paper. Three types of tests were run in order to compare the revaporization of retrograde condensate formed in a cell with that formed in a sand-packed cell, and to establish the effect of time. The results of the tests presented in the paper, the authors believe, indicate that both time and the presence of sand promote the revaporization of the retrograde liquid.

Bauer on Middle East Oil

The place Middle East oil will occupy in world markets was analyzed by C. J. Bauer. One of the critical problems affecting this strategic area during the next four years was described as being the successful completion of the various foreign pipelines. To balance the world supply, economic considerations anticipate a Middle East oil production of over 1,600,000 barrels a day by 1951—nearly double the 1947 figures. If the pipelines are not completed, the author sees a serious

set-back to the Marshall Plan for the economic reconstruction of Europe.

Middle East Countries

It was explained that countries included in the Middle East cover about 2 million square miles, or about 67 % of the area of the United States. One concession alone, the Arabian grant, covers approximately 435,000 square miles, an area equivalent to the states of Texas, Oklahoma, Arkansas and Louisiana combined.

The distance from the Persian Gulf where the principal fields are located to a point in the Mediterranean where the planned pipelines will terminate is between 750 and 1,000 miles. The shipping distance from the head of the Persian Gulf to a point in the Mediterranean where the Big Inch lines will terminate is 3,300 miles. The pipelines will lessen shipping cost, and eliminate the Suez Canal tolls which amount to about 17 cents per barrel.

Crude Reserves Enormous

Middle East crude oil reserves proved on January 1, 1947 were estimated at approximately 28 billion barrels, or 42% of the world total and 62% of the foreign proved reserve. The U.S. share of this was 10 billion barrels, or nearly 36%. American participation is probably higher at present as one of the American companies found an important extension in Arabia in the latter part of 1947.

At the end of 1947, five Middle East countries were producing oil in excess of 900,000 barrels a day, of which American participation was 42%, or 395,000 barrels. Reserves and production per well is the greatest of any area in the world. Production in the Middle East can be secured with minimum requirements in material and effort, as compared with other areas of the world. As an example, the Haft Kel field in Iran, discovered in 1925, produced about 190,000 barrels per day in 1947 from three wells. The other large field, Abqaiq, in Arabia, a more recent discovery, was producing over 200,000 barrels a day at the end of 1947 from 25 wells. That is an average of about 8,000 barrels per day per well. By comparison, the largest producing field

Dean Sheldon
(Chairman of the California Petroleum Division Group)

in the United States, East Texas, is currently producing about 295,000 barrels a day from between 23,000 and 24,000 wells. Refinery runs in the four major Middle East refineries and a few smaller plants were in excess of 700,000 barrels a day at the end of 1947.

Oil Demand in 1951

The author estimates that the petroleum industry is confronted with the probability that aggregate world demand for its products will approach 10.7 million barrels daily in 1951, or 23% above 1947. The increase alone of more than 2 million barrels per day is equal to the domestic consumption in the United States in 1925. It is not anticipated that supplies of products derived from non-crude sources — natural gasoline, alcohol, benzol, oil shale, coal and natural gas—will contribute much of a gain within the next four years. The main task of supplying the increased requirements will consequently be in the hands of producers and refiners of crude oil. Production and runs will each have to be increased nearly 2 million barrels a day. Concurrently, additional facilities on a comparable scale will be needed to handle and move crude oil from fields to refineries and products from refineries to consumers. Pipelines and tankers are vital links in the chain, it was stated.

Immediate Oil Supply Good

There is no serious concern about the overall availability of crude oil in the immediate future, the author asserted. The first problem will be the industry's ability to obtain sufficient materials, particularly steel, in sufficient quantities to complete additional facilities in time. The United States, if production cannot be increased above present levels, will become a net importer each year and, by 1951, net imports may go in excess of 500,000 barrels a day of crude and products. This should cause no real concern from the civilian point of view because supplies are available in the principal exporting areas in the Caribbean and the Middle East. Moreover, as a result of the far-sighted policy of American operators during the past era of large surpluses, a major American position was gained in the Caribbean and Middle East areas.

Howard on the Conversion of Coal to Oil

Frank A. Howard discussed the problem of converting coal into oil and gas. It was cited that a recent estimate places the deposits of all grades of coal at 2,536 billion tons. An estimate of available fluid fuels in the form of crude oil and natural gas is given as 10 billion tons.

Coal can be converted by the destructive hydrogenation process, the author stated. Hydrogen can be caused to combine with coal under catalytic conditions to yield hydrocarbon liquids. On a commercial basis it is described as possible to convert as much as 80% of the combustible matter in lignite coal into liquid hydrocarbons of a wide range of boiling points resembling a synthetic crude oil. The intermediate and heavier fractions of this synthetic crude oil, or the same fractions of natural crude oil, could be subjected to the same process under slightly different conditions and with different catalysts to carry the destructive hydrogenation further, and eventually convert the entire liquid product into gasoline and hydrocarbon gas. The liquid gasoline yields obtained in some cases have been actually above 100 percent by volume compared to the heavy oil charged, since the gas loss was more than compensated for by the change in specific gravity of the liquid. An important char-

acteristic of the process is that it resulted in the virtual elimination of sulphur from liquids produced, the original sulphur content of the coal or heavy oil emerging as hydrogen sulphide gas.

Fischer-Tropsch Process

Large American reserves of cheap natural gas had, from the outset of oil hydrogenation operations in the United States, been regarded as the preferred source for hydrogen, and there has been developed here a satisfactory and practical method, based upon original German work, for converting natural gas into water gas by catalytic reaction with steam. The carbon monoxide content of the water gas is again combined with steam in a second catalytic stage to produce carbon dioxide and more hydrogen. In this process methane can also be catalytically reacted directly with oxygen to form gasoline and other products.

The utilization of the hydrocarbon synthesis process for the manufacture of gasoline from natural gas does not look like a direct attack upon the conversion of coal into oil or gas. It was explained, however, that the synthesis operation itself (the conversion of water gas or synthesis gas into liquid products) is the same process and requires the same equipment and experience whether the synthesis gas be produced from coal or from natural gas. The author stated that by converting natural gas into gasoline, industry is also piloting the conversion of coal itself into gasoline, the only difference between the two operations being that more efficient methods of coal gasification must be developed.

U.S. Coal Liquefaction not yet Commercial

The hydrocarbon synthesis process and the high pressure hydrogenation process have each been shown, the author concludes, to be practical roads which may be followed to convert coal into oil, with a byproduct yield of hydrocarbon gas in both cases and also a byproduct yield of basic chemicals in the hydrocarbon synthesis operation. Neither process has yet been applied to coal conversion in the United States on a commercial scale, it was explained, but the European foundation of the processes is well known to competent engineering organizations in the United States. The approaching completion of two commercial plants for the synthesis of gasoline from natural gas and the active development programs on the production of synthesis gas from coal by improved methods will advance the hydrocarbon synthesis process beyond its European development.

Walter B. Hester
(Added his presence to meeting)

Breston and Hughes on Water Flooding

Experimental work on the relation between pressure and recovery in long core water-floods was recounted by J. N. Breston and R. V. Hughes. The paper described a series of laboratory water floods using consolidated cores of widely differing characteristics saturated with live crude and flooded with oil field brines in an effort to simulate field conditions under various pressure gradients and flooding velocities. Percentage recovery in terms of the total oil in place at the start of the flood plotted against pressure gradients and flood velocities show greater recovery at higher pressures for both cores. Increased recoveries are shown for one core at higher pressure gradients and flood velocities when plotted in relation to residual saturations.

Experimental Differences Clarified

Conclusions drawn by previous research workers with respect to the relation between pressure gradients and/or velocity and oil recovery obtained by laboratory water flood tests have been in disagreement probably due to variable procedures and unnatural conditions and materials. It was explained that the Bradford Laboratory of the Pennsylvania Grade Crude Oil Association as part of its secondary recovery research program has conducted sixteen water floods on two long cores of widely differing characteristics in an attempt to clarify this relationship and make it an aid in predicting flooding pressures in the field.

Unlike previous research procedures the present experiments were conducted with the aim of duplicating field conditions as closely as possible by using long unextracted consolidated cores, a live crude, and natural brines for both flooding and connate water content. Also, the pressure gradients and flooding velocities were representative of field conditions where similar sands were being flooded. Nine of the eleven floods on one core showed a definite increase in the percentage of oil recovery with increased pressure gradients and velocities. Five floods on the second core showed increased recoveries and lower residual oil saturations with increased pressure gradients and velocities. A marked decrease in recovery for both cores was obtained at very low flood velocities.

The authors point out that the observations made during and as a result of their flooding experiments are not to be interpreted that every type of sand which can be water flooded will produce the maximum yield of oil at high pressure gradients. There may very well be an optimum pressure for every sand depending upon many variable physical and chemical characteristics and upon the ration and mode of distribution of its water and hydrocarbon content. Proper pressure gradients for field use are still difficult to predict.

Pogue and Coqueron on Oil Industry Capital

In an interesting analysis of factors affecting capital formation in the petroleum industry, Joseph E. Pogue and F. G. Coqueron concluded that the petroleum industry generates out of its own operations

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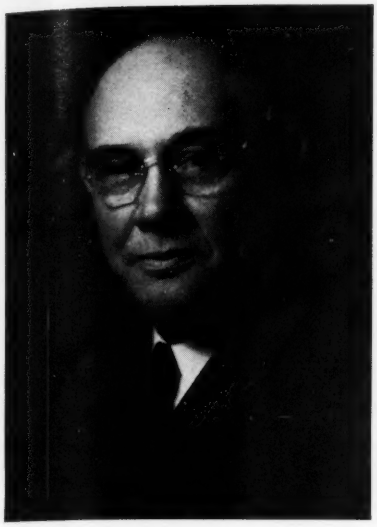

W. H. Geis
(Attended Meeting from California)

most of the capital required for its expansion and is a leading industry in the process of capital formation. It has been retaining a growing share of its net income for reinvestment, the authors declare, and the proportions have reached 65.1 percent in 1947.

The oil industry will be able to finance its capital requirements for 1948 largely out of its internal capital formation, with an expected smaller recourse to capital markets than in 1947. It was explained that of the 1947 capital expenditures of 30 oil companies aggregating 1.95 billion dollars, 57 percent, or approximately 1.11 billion dollars, represents expenditures resulting from the rise in construction costs from the 1939 level, including some technological changes such as deeper drilling.

M. G. Gamble on Oil Transportation

In a paper dealing with petroleum transportation with special reference to tankers ,M. G. Gamble pointed out that in recent months one of the foremost problems faced by the oil industry has had to do with the transportation of petroleum by water. Until the late Fall of 1947 there were 96 new U.S. Government owned T-2 type tankers and about half that number of converted Liberties in layup, and in spite of the substantial progress which was made in December and January in placing vessels in operation, on February 1 there still remained more than 40 of such vessels in the tied-up fleet.

Described among the other factors which have contributed materially to the apparent shortage are: 1) the shipyard strike which resulted in a large number of tankers being inoperative from July to November, 1947; 2) the slow processing of purchases of tankers from the U.S. Maritime Commission which in most cases required several months; and 3) the fact that both military and commercial requirements have proved to be far in excess of previously estimated needs. More recent factors causing further delay in catching up with the accumulated shortage of available transportation have been the time required in repair yards to carry out the so-called "strapping" recently required by the Coast Guard regulations, and otherwise fit the vessels for service. However, today the overall situation shows marked improvement, the author stated.

World-Wide Tanker Picture

Looking at the problem on a world-wide basis and expressing all ocean tonnage in terms of equivalent T-2 type tankers, which have a deadweight tonnage of 16,600 tons and a speed of 15 knots, the author finds that there are the equivalent of some 1300 of such vessels in the world today. However, in this total are about 300 which cannot be considered as part of the fleet available for the commercial transportation of petroleum. In this latter group are tankers undergoing major protracted repairs, obsolete and damaged vessels destined for scrapping, certain Government owned military and naval service tankers, and those employed in special trades such as whaling, molasses and vegetable oils. When all voluntary tieup is eliminated, the author believes it is expected that about 1000 equivalent T-2's will be available for the petroleum trade. In addition, best information indicates that there are now on order or in the process of construction the equivalent of about 31 T-2's in the United States and 148 in Europe, all destined for the transportation of petroleum.

New Tanker Types

Larger and faster tankers provide an answer to high operating costs

L. W. Chasteen
(Made the long jaunt to New York)

—especially those concerning American owners — but a natural question is how far can the problem safely go in the matter of size and speed? The author explained that there have been difficulties in accommodating T-2 tankers in some ports, although numerous waterway improvement projects completed, or under way by U. S. Army Engineers, together with terminal developments by private companies, have greatly improved this situation. Recent studies have led to the design of a 26,000 ton, 16 knot vessel with a length of 628 feet and a draft on summer freeboard of 31½ feet. It was stated that although these vessels have a carrying capacity of 228,000 barrels of light gravity cargo, their draft, being only about one foot more than that of a T-2, will permit their entrance into the majority of ports, which can accommodate T-2's with full cargo. Although the use of a tanker of this size will involve some sacrifice in flexibility, it is estimated that transportation costs will be about 20% less than in a T-2.

Inland Waterways

The author revealed that there are more than 26,000 miles of navigable waters in the United States. Of this total mileage of 9200 miles, or about 37%, have a depth of nine feet or more; and 14,300 miles, or about 54%, are six feet or more in

(Continued on Page 46)

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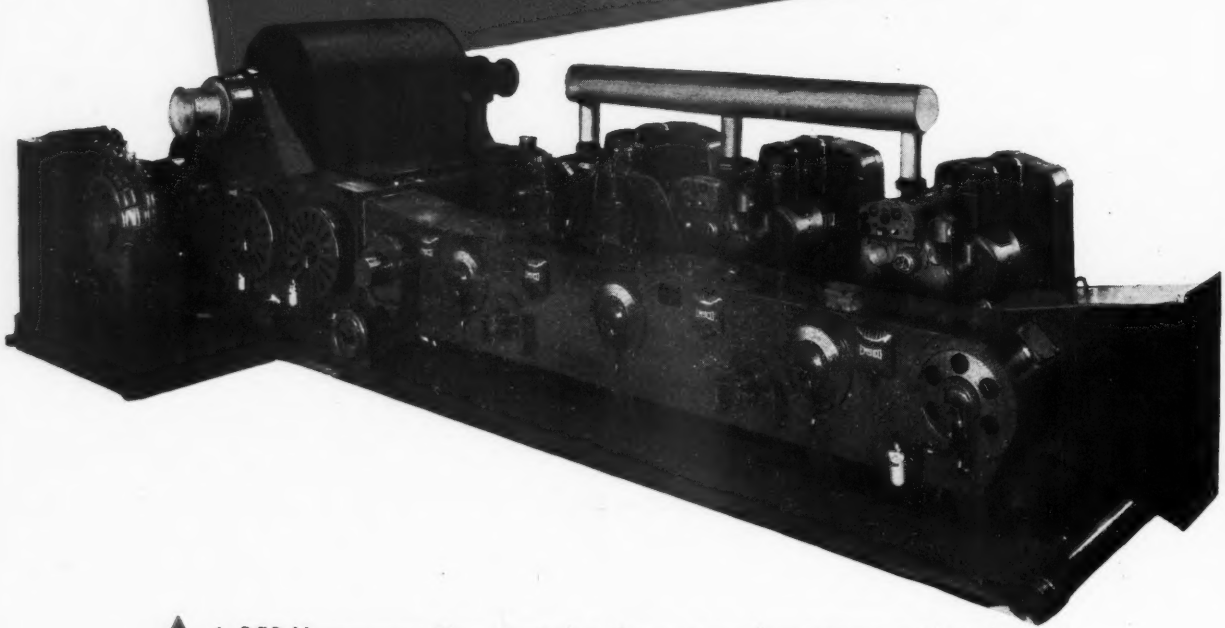

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Measurement and Flow Control Instruments Applied to the Modern Refinery

By
Alfred Krieg,
Supervisor of Instrument Department
Socony Vacuum Oil Company, Inc.
Paulsboro, N. J. Refinery

Quantity production of quality petroleum products can be assured only by the accurate measurement and control of flow rates of process streams in the producing units.

In oil blending, where operations require the proportioning of several streams, the selection of proper equipment will assure a quality product and also decrease storage capacity and pumping units and will effect savings in time and labor.

Operation and production costs are determined, to a great extent, by the use of flow measuring instruments. These requirements therefore increase the general instrumentation of the process units, and the selection and application of the proper flow measuring instruments will result in substantial savings.

Measurement

The differential pressure type meter is generally used for flow measurement and control at the Paulsboro Refinery of the Socony Vacuum Oil Company, Inc. This is largely due to its inherent flexibility of application. The meter range may be readily changed in the field when required by varying flow conditions and the primary element may be installed or changed at minimum expense.

With favorable process conditions and proper installation the error over the operating scale range of the differential type meter should not be greater than plus or minus two percent. The instrument and integrator may be calibrated, however, to less than one percent error over the working range.

Accuracies as high as one tenth of one percent are claimed by manufacturers of some volumetric displacement meters. As volume measuring devices these meters have their place in many refinery applications, however their flexibility is not comparable with the differential type meter.

Primary Elements

The differential flowmeter operates on the principle that there is a different differential pressure created across a restriction (or primary element) in the flow line for each rate of flow.

The three types of primary elements generally used for flow measurement are the orifice plate, the flow nozzle and the Venturi tube.

As a primary element, the pitot tube also deserves mention. This device is not a restrictive unit and as its use is generally limited to test work at the refinery, its design and uses will be considered later in this article.

Various forms of each type of primary element are available and used for specific qualities which will be discussed.

Thin Plate Orifice

The concentric type, thin plate orifice (Figure 1), is by far the most widely used type of primary element for use with the differential type flow meter.

Orifice design for the measurement of any clean fluid is made available by the publication of reliable, accuracy proven data and the orifice accuracy of the thin plate orifice compares favorably with other commercial type primary devices when not individually calibrated and when used on applications for which the orifice is adopted.

Flexibility and ease of installation are the greatest advantages of the thin plate orifice. Many refinery instrument departments have facilities for the design and fabrication of orifice plates. The plate is installed between orifice assembly flanges or conventional pipe flanges and used with pipe taps. This permits removal of the plate for inspection or replacement with a minimum line shutdown time.

Another advantage is the low cost of the orifice plate as compared with the flow nozzle or Venturi tube which requires accurate machining operations.

As the flowing fluid approaches the orifice plate in the line an abrupt change in direction takes place and this causes a higher permanent pressure loss than with the flow nozzle or Venturi tube. This, however, can in many cases be held within specified limits by use of proper orifice ratio and differential.

On orifice calculation, when estimating pressure loss using graphs or curves, it should be considered that normal operation is generally much lower than maximum capacity and the actual operating pressure loss will therefore be much less be-

Figure 1

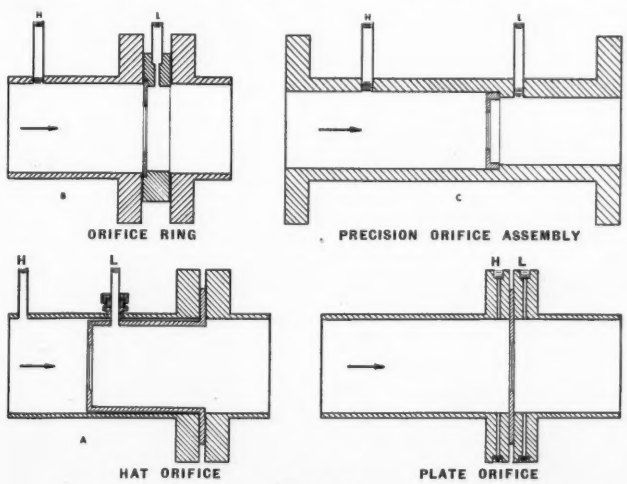
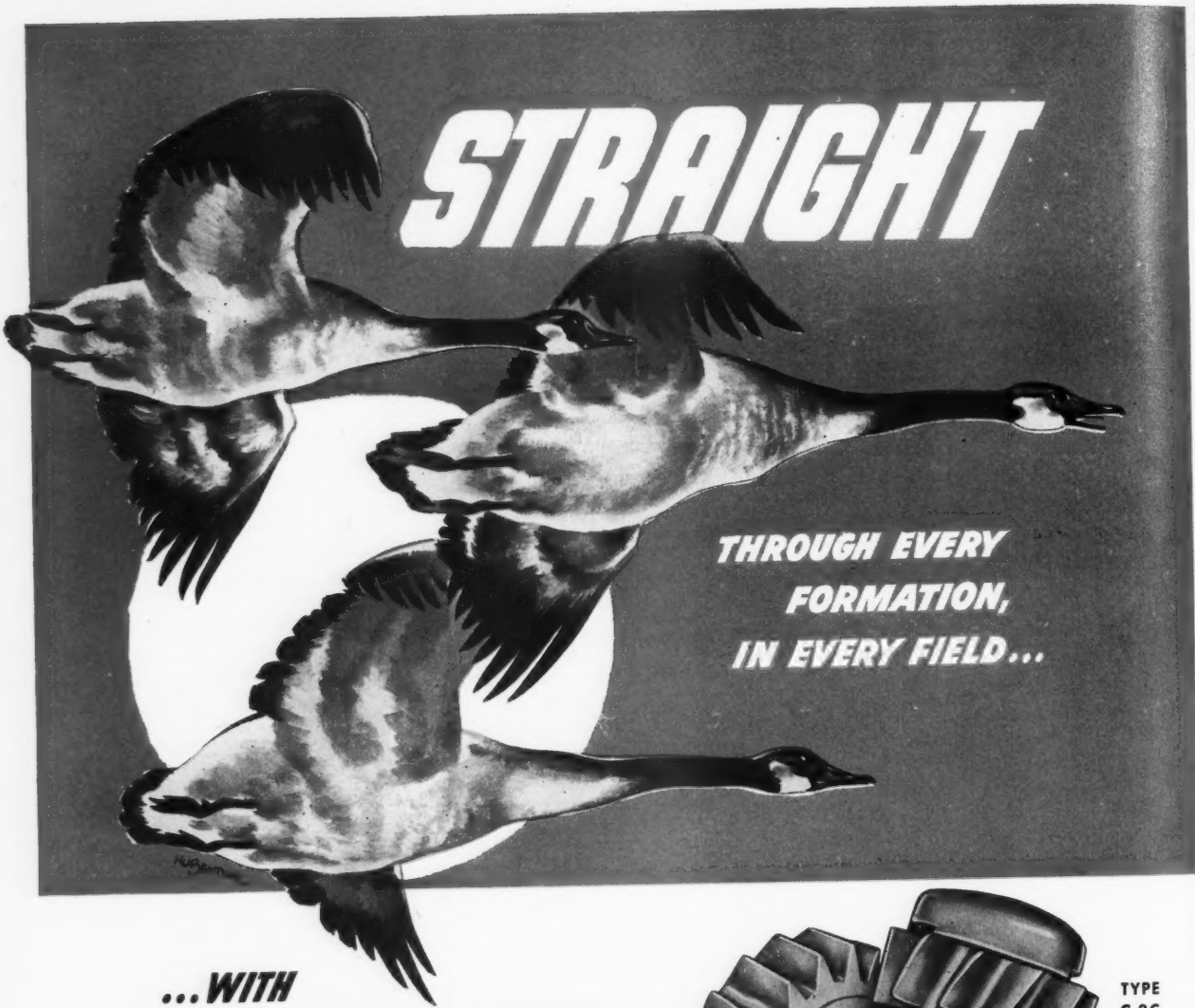


Figure 2



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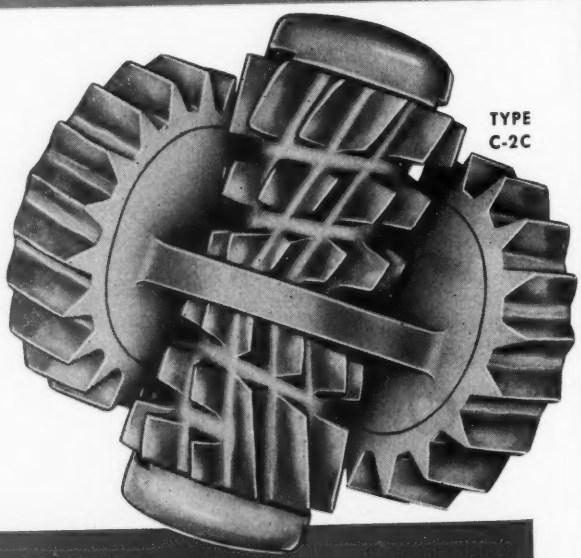

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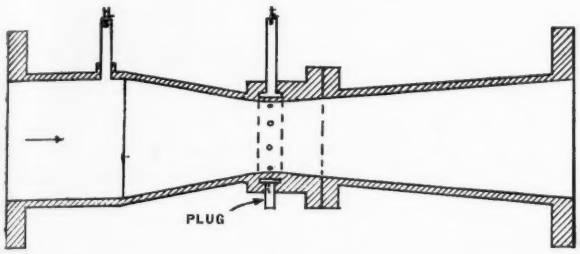


Figure 3

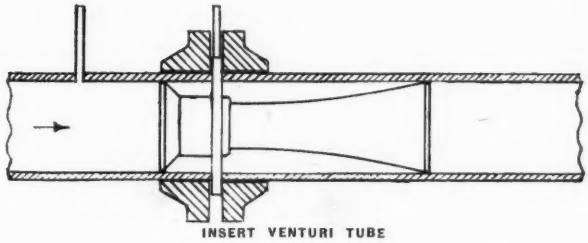


Figure 4

cause of the square relationship between differential pressure and velocity.

Plate orifices are made in three conventional types (See Figure 1): concentric, eccentric, and segmental. Of these the concentric type is most widely used for the flow measurement of clean fluids. On applications measuring materials containing solids in suspension there is a tendency for the solids to deposit on the upstream side of the orifice, causing erroneous readings. The segmental and eccentric types of orifices are designed to permit the passing of such fluids through the opening. Special calculation of these types are desirable.

Primary devices of many types and designed for various applications are available such as the hat orifice, carrier rings and precision orifice assemblies. (See Figure 2). Orifice fittings for the quick change of orifice under pressure and the precalibrated, adjustable orifice assembly are also used on installations where process flow conditions vary frequently.

A general discussion of these devices, their uses and advantages are described in many manufacturers' catalogs, and must be curtailed in this article due to space limitations.

The Venturi Tube

The pioneer of the flow measuring devices or primary elements is the Venturi tube.

This device, Figure 3, is inserted in the pipe line similar to a pipe section or spool. The entrance section has the same internal diameter as the pipe in which it is installed. The entrance section leads into a cone connected to the throat. This section is accurately machined to design calculations and is smaller in diameter than the entrance section, and is then connected to the exit section or cone. The high pressure connection is made as shown in the entrance section and the low pressure connection is made in the throat. The pressure difference between the two connections produces the differential head for meter actuation. Venturi tubes can be made of any material to meet required fluid conditions.

The insert Venturi tube, Figure 4, retains the desirable characteristics of the standard tube. Among the added advantages are its adaptability for extremely high pressure measurement and the expensive construction of the conventional tube under such conditions is avoided.

The unit is held in position between the pipe flanges by a flange arrangement made integral with the tube. The low pressure meter connection is in this flange and the high pressure meter connection is made in the pipe—upstream. The insert units are precision machined to obtain the accurate readings inherent in the conventional Venturi.

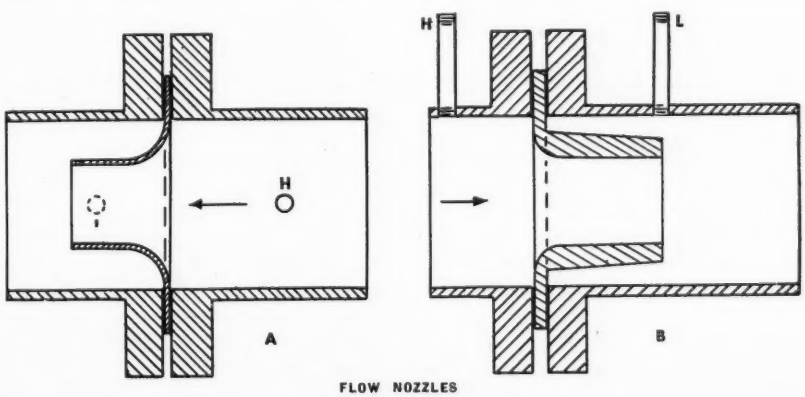
Venturi tubes are highly accurate at any pressure at capacities limited only by line sizes, and attains its highest accuracy at high flow rates. The entrance cone gradually guides the fluid through the throat without the turbulance created by the plate orifice. This results in a small pressure loss at the section and permits a greater quantity to pass. The flow of fluids containing solids and slurries are more readily measured by this device although some form of purge is required on some installations.

In comparison with the flow nozzle or orifice plate, the initial installation cost of the Venturi tube is very high and tube sections for larger sized lines are bulky and unweildy for normal handling and changes are expensive.

The Flow Nozzle

The flow nozzle, Figure 5, has a much greater capacity for a given throat diameter than the thin plate orifice due to its stream-line approach. It is generally used where the expense of a Venturi tube installation is not justified and where high flow velocities exist. The flow nozzle accuracy is not as high as the Venturi tube; however, it has a small increase in pressure recovery as compared with the orifice plate like installations, and it is especially adaptable for high velocity flow measurement.

The nozzle is installed in the line similar to the orifice plate installation. However, it cannot be changed



FLOW NOZZLES

Figure 5

or inspected as easily as the orifice plate due to its design. Flow nozzles are also made from various metals to suit service demands and for the smaller line installation they are spun from light gauge metal. The larger sizes are machined from castings and forgings.

The Pitot Tube

As a primary element, the Pitot Tube, Figure 6, employs the differential between the impact and static pressures to obtain the fluid velocity for calculating the flow. A complete line traverse is required to accurately establish the velocity coefficient.

The Pitot tube is most widely used as a testing device where spot checks are required, and on large lines or ducts where Venturi tube or orifice installations are impractical and expensive. It is limited for commercial use to application of ideal conditions of steady flow. low viscosity. The pressure apertures are small and are, therefore, easily plugged and limiting its use to clean fluids. The accuracy of this measuring element is higher on high velocities however at existing velocities in certain sized pipe it is capable of producing one differential which is often too low for use on differential meters.

Summary

In selecting the proper flow measuring primary device for specific applications, the important factors for consideration should be,—flexibility, accuracy, cost, efficiency and wearing resistance. Each of the types discussed has distinct advantages in design for specific applications. These advantages will now be summarized.

The Venturi Tube

Flexibility — Poor flexibility — larger sizes cannot easily be changed and is awkward to handle.

Cost — Initial and replacement cost very high and must be purchased from Instrument Manufacturer.

Efficiency—Excellent efficiency—pressure recovery approximately 88 percent.

Accuracy — Considered most accurate measuring device available.

Resistance to Wear—Smooth surfaces decrease resistance — no restriction to foreign material.

The Flow Nozzle

Flexibility—Flexibility fair, is not easily installed or replaced.

Cost—Initial cost lower than Venturi tube but higher than plate orifice.

Efficiency—High efficiency, pressure recovery greater than with orifice plate.

Accuracy — High accuracy especially at high velocity and on high ratio d/D.

Resistance to Wear—High resistance—high reliability on dirty service.

The Orifice Plate

Flexibility — Excellent flexibility, easily made, altered, installed and replaced.

Cost — Low cost — inexpensively purchased or made in a shop lathe.

Efficiency—Low efficiency—pressure recovery lower than flow nozzle or Venturi tube.

Accuracy — good within specific limits of ratio d/D.

Resistance to Wear—Low resistance to abrasive materials. Restricts flow of dirt and sediment.

Straightening Vanes

Pipe fittings and valves, etc., in a line upstream from a primary element will cause a turbulance in the flow, particularly in gas flow measurement. Such a disturbance causes inaccuracies in meter readings. This condition can be eliminated by installing a long length of straight pipe, without fittings ahead of or upstream from the orifice. This method is not practical for all installations and in such cases, straightening vanes (see Figure 7) must be inserted in the line upstream from the orifice assembly to obtain suitable measurement.

Straightening vanes are made in various forms to parallel the stream to the pipe axis. This tends to nullify disturbances such as eddies, swirls and cross currents created by fittings in the line ahead of the orifice. The vane is tack welded into one end of the straight line at least six pipe diameters from the orifice.

Pulsating Flow

Reciprocating pumps and process

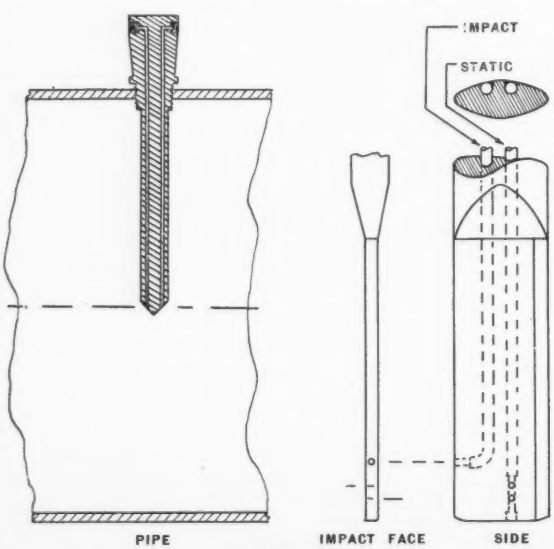


Figure 6

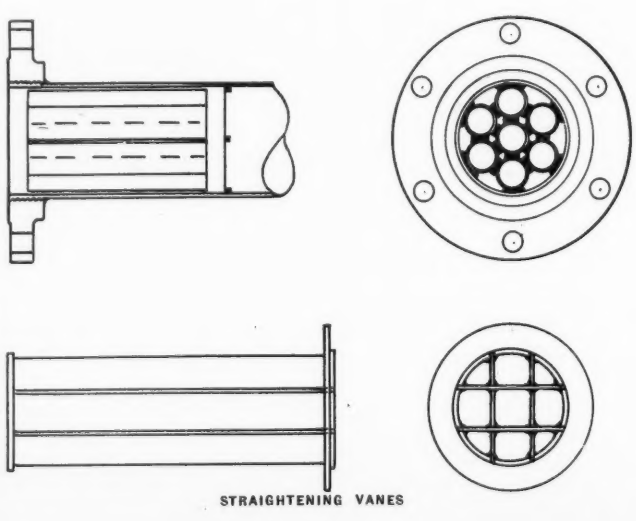


Figure 7

system pressure fluctuations at times cause an unsteady or pulsating flow on some applications and this condition will result in high measuring applications. Very little positive data are available for the elimination of this condition, however, methods have been devised for the reduction of the error.

(1) Install the orifice as far as possible from the pulsation source. This will tend to stabilize the pressure.

(2) Install an additional orifice designed to produce a minimum drop of 3 p.s.i., twenty-five pipe diameters ahead of the metering orifice.

(3) The most effective method for fluid measurement, is the installation of an air chamber in the line to reduce pulsations. The chamber should be installed vertically at a point close to the pump discharge, and arranged so that air may be injected when required.

Differential Type Flow Meters

Many present day process developments would be difficult without some method of maintaining a continuously uniform rate of flow. As a rate measuring device the differential type meter is readily adapted to continuous process control. Many industrial processes demand continuous balanced operation as non-uniform flows upset other control instruments on the unit.

The differential type meter also has other desirable characteristics. Outstanding among these is flexibility. Almost any operating temperature, on a wide range of pressures and its capacity may be quickly changed by replacing the manometer range leg or by changing the primary measuring element.

Another desirable feature is the absence of flow of the measured material through the meter mechanism.

The differential type meter is not well adapted for installations where flows are intermittent or reversing nor is it suitable for extremely low flows especially in cases where the material carries solids in suspension or is extremely viscous.

Classification of differential type meters may be of two general types, the mechanical and the electrical. In selecting these for a given application each of these types warrants consideration as to inherent principles and specific design characteristics. The transfer of the differential pressure from the manometer to a chart flow reading is by a direct mechanism in the mechanical type meter, see Figure 8. For applications where remote recording or indication of the flow is required, the mechanical type meter may be equipped for pneumatic transmission. This system accurately transmits indications for a distance of 1000 feet and has high flexibility.

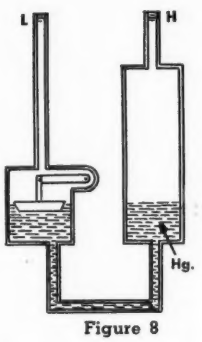


Figure 8

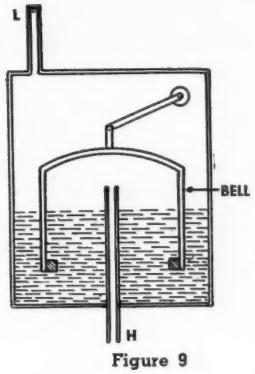


Figure 9

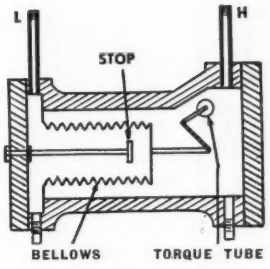


Figure 10

Flow meters of the mercury filled type generally are a modification of the simple "U" tube manometer. They are designed with the leg containing the float mechanism being fixed in contour, while the range leg is of a given diameter to meet a specific flow condition. The range tubes are interchangeable and are supplied by meter manufacturers, to give ranges of pressure differential from 1 inch to 200 inches of water.

One of the most common types consists of the manometer to which is attached an indicating or recording mechanism. Transfer of the differential from the manometer is by means of a pressure tight bearing to the pressure end of which the float is connected. The case end of the bearing shaft is connected to the pen arm or pointer through suitable linkage. The float must be of size and design to supply sufficient power to overcome the friction in the pressure bearing and linkages to accurately transmit the differential. Low cost, accuracy and simplicity of design with few working parts are some of the outstanding features of this type measuring device.

Low Pressure Type

Mercury actuated meters of the design previously discussed are not sufficiently sensitive or powerful for the mechanism operation on ranges below 20 inches of water differential since the maximum mercury level deflection is only a fraction of one inch. This problem is overcome by using a bell float in a single chamber as shown in Figure 9. Greater power is made available by the large diameter of the bell, the travel is multiplied and friction losses reduced.

There are various methods employed to transfer the differential in the manometer to the flow indication on the chart.

One method makes use of the tilt balance principle whereby a ring shaped manometer containing the mercury is balanced on knife edges. Pressure differential across this ring causes a proportional tilting which is transmitted to the flow pen.

Another system is designed with a magnetic clutch or coupling between the manometer and the instrument case thus eliminating any form of pressure bearing or possible leakage.

Mercury-less Meters

All the meters discussed hereto are of the Mercury filled manometer or "U" tube type. Another type of differential measuring instrument is the Aneroid flow meter. See Fig. 10. The pressure body is a steel casting of suitable design to house a sensitive metal bellows unit which actuates a torque tube assembly to transmit the differential pressure to the chart by suitable linkages. Where a change of meter range is required, the torque tube is replaced

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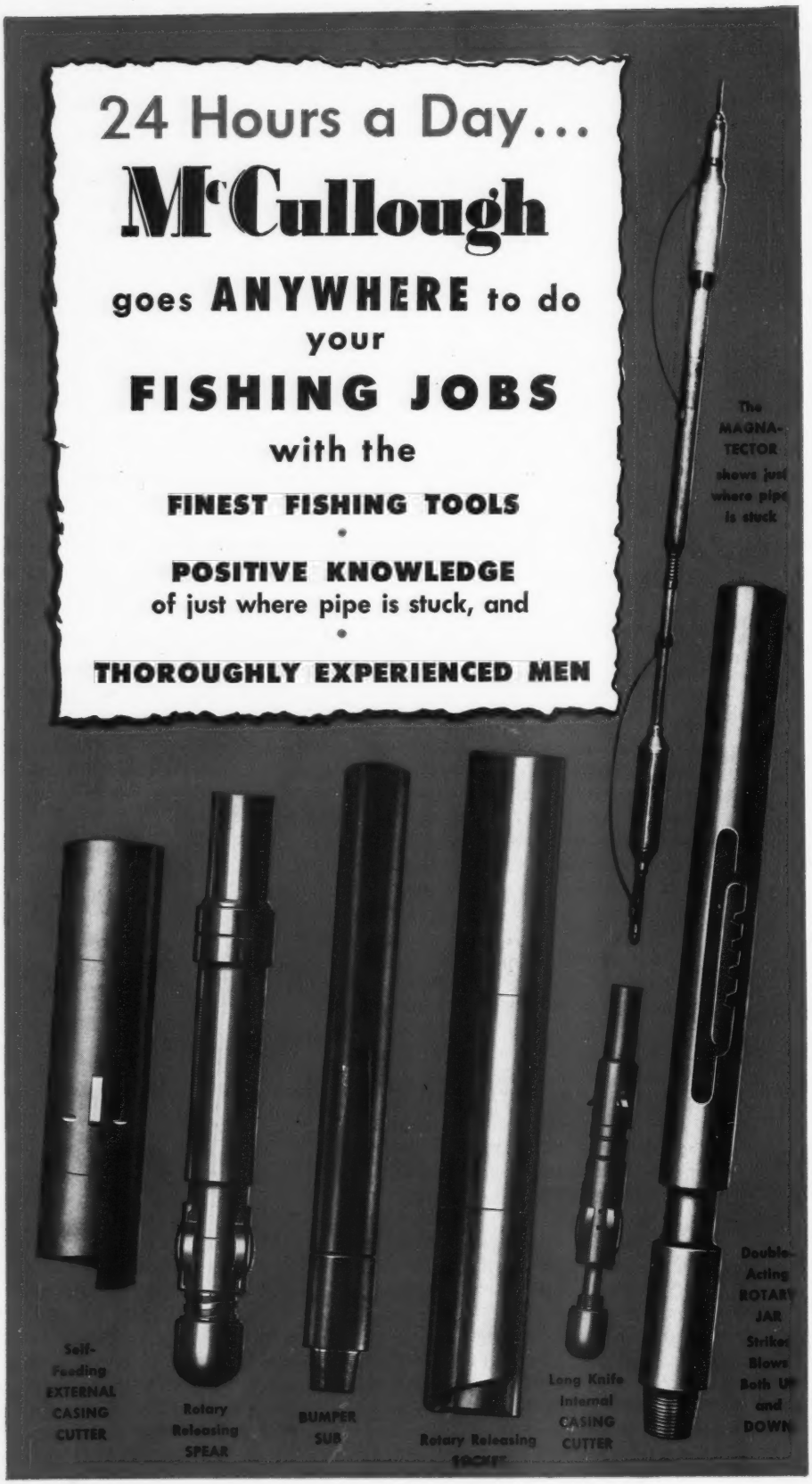
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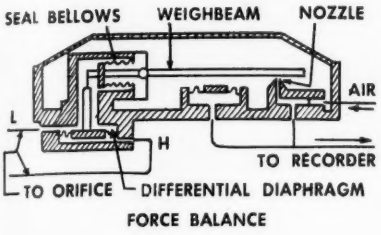

Figure 11

by another tube of suitable design much the same as range tubes are changed on the manometer type meters. Condensate accumulation may be conveniently removed by two drains provided at the lowest points of the Aneroid housing.

Another advantage of this type instrument is its sensitivity to small flow changes which is lacking in the conventional mercury filled manometer. This is due to the inertia effect characteristic of mercury. Caution must be exercised to prevent damage to the unit by a high differential pressure across the bellows when the instrument is cut into service or when blowing down the orifice lines.

Force Balance Type

The force balance measuring element uses a differential diaphragm unit with a weigh beam pneumatically operated to measure and transmit the differential pressure to the chart. The same unit is also applicable to the measurement of liquid level and pressure. See Figure 11.

The small motion required by the bellows or diaphragms for measurement prolongs the life and accuracy of the vital parts and is one of the features of this unit.

The torque tube, pressure bearing and stuffing box are eliminated with this element where the beam is enclosed in the pressure chamber by the bellows arrangement.

The unit is designed for 2000 p.s.i. and differential pressure ranges are available from 0.2 inch to 40 inches of water. Ranges are conveniently changed by replacing the diaphragm plates or by changing the reaction diaphragm location on the weigh beam.

Standard range of the transmitter unit is 2 p.s.i. to 14.2 p.s.i. pneumatic pressure to the receiver or recorder, this range is however adjustable to other requirements if necessary.

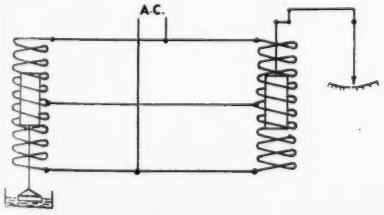

Figure 12

Electrical Type Meters

Many of the electrically operated flow meters use the conventional mercury filled "U" tube manometer, some types with a float mechanism and with provisions for changing the differential range.

The inductance bridge type flow meter is designed with many of the conventional mechanical flow meter characteristics. The manometer or transmitter has no pressure tight bearing and is therefore free from the inherent leakage and friction at this point. Electrical transmission of the float motion on the mercury is provided for by using a divided inductance coil in the transmitter and in the recorder or receiver. See Figure 12.

The transmitter coil is centered on a non-magnetic tube in which a soft iron armature, attached to the float, moves with mercury level changes. An identical armature is suspended from a balanced arm into the core of the receiver or recorder coil. Any unbalance of the inductance bridge circuit due to float armature motion causes a repositioning of the armature in the recorder coil and this movement through linkages moves the pen arm until a distance equal to the float armature motion has been attained. This motion results in a balance of the bridge circuit.

Another inductance bridge type flow meter manufacturer uses a sensitive galvanometer connected into the circuit which detects the unbalance and actuates a motor driven mechanism to reposition the armature of the receiver coil thereby rebalancing the circuit. In this type also the pen arm is actuated through linkages from a balanced arm. See Figure 13.

An electrical conductivity type flow meter requiring only a resistance unit and mercury in the manometer or transmitter is shown in Figure 14.

Fixed resistances in series are connected to rods of varying lengths in spiral form which extend down-

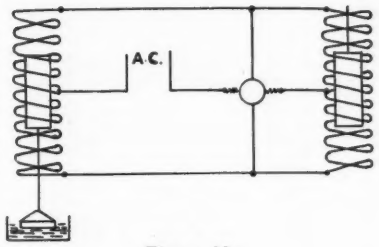

Figure 13

ward toward the mercury. A movement of the mercury in the chamber, caused by the differential, makes contact with the rods. As the mercury height increases, the resistance in the circuit is decreased which increases the current flow. The system is actuated by a conventional watt hour meter which serves as the integrator, and the recorder is a simplified wattmeter.

As the manometer is sealed in oil, it is of utmost importance that the manometer be entirely free from leaks especially on steam or water measurement. A small oil leak will permit a water level increase which will eventually short circuit the electrical resistance unit.

Some electric type flow meter manufacturers have available the bell type low pressure meters. These measuring devices are characteristically the same in operating principle.

An outstanding feature of the electrically operated meter is its remote transmission characteristic. The transmitter may be located a considerable distance from the receiver, recorder—controller or indicator eliminating long meter lines with their inherent leaks, air pockets, etc. This advantage also makes possible the modern centralized control room operation of process units.

Concluded in next or 2nd March Issue

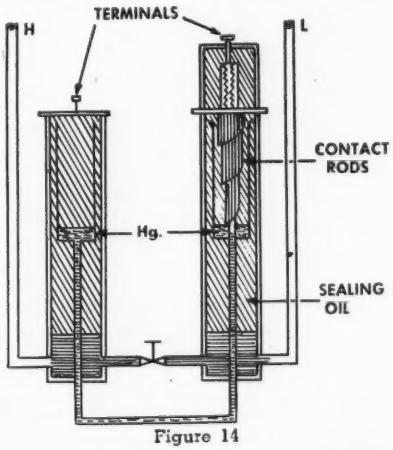

Figure 14

Industry is on the Move .... Westward

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OMAHA 2, NEBRASKA

G. F. ASHBY, PRESIDENT

To American Industry:

The Union Pacific West offers industry proximity to products of ranch, mine and forest...ample power, fuel, water...healthful living conditions in scenic, recreational regions...and native-born, high-type labor.

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Yours very truly,

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* One of a series of advertisements based on industrial opportunities in the states served by Union Pacific Railroad.

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UNION PACIFIC RAILROAD

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Field Development

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Los Angeles Basin

Seal Beach Try Spudding

Marine Exploration Co. is about to spud its new State No. 2 wildcat in Sec. 11-5s-12w which will be whipstocked off the mainland at Seal Beach to a point approximately half mile seaward. The company about three years ago drilled its first well there, carrying the hole about 3500 ft. out to sea. Only a small amount of gas was obtained and the well recently was abandoned.

Standard Plans Sunset Beach Try

Standard of California has staked location for Lomita Land & Water Co. No. 3-1, a wildcat test in Sec. 19-5s-11w in the Sunset Beach area of Orange County. The company's Houghton Comm. No. 1-1 in Sec. 36-2s-12w near the Santa Fe Springs field is spot coring at 13,425 ft. Six Companies No. 4 in Sec. 2-3s-15w at El Segundo has been finished at a redrilled depth of 6730 ft. Rate of production last reported was 127 barrels of 20.2 gravity oil a day, cutting less than 1 per cent.

Brea-Olinda Test Coring

Union Oil Co. continues to spot core at 4083 ft. with its Gaines No. 1 test in Sec. 10-3s-9w in the Brea-Olinda area, Orange County.

Palmdale Test Reconditioning

In the southern middle part of Antelope Valley near Palmdale, Antelope Valley Dev. Co. is cleaning out at 2895 ft. with its Del Sur No. 1 in Sec. 26-7n-13w, Los Angeles County. Total depth is 3035 ft.

Whittier Test Stands Cemented

Livingston Drilling & Dev. Co. is preparing to gun perforate and test by stages with Dewey No. 1 in Sec. 1-3s-11w at East Whittier, which is standing cemented with blank liner set on bottom at 8521 ft.

Oceanside Test Listed

Charles F. Holmes of San Bernardino is ready to start work on Holmes No. 1 exploratory hole some 400 ft. north and 350 ft. west from the center of Sec. 31-11s-4w in the Oceanside area, San Diego County.

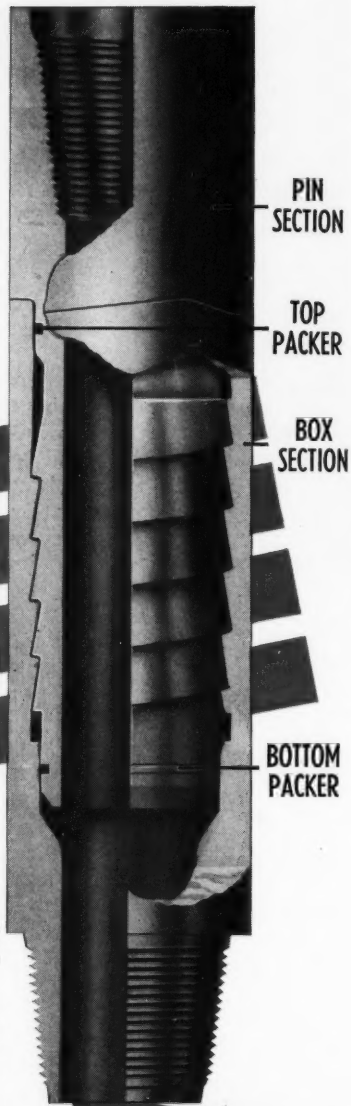
Los Angeles Test Runs Pipe

In the East Los Angeles industrial area, E. W. Pauley is running casing to cement at a point above bottom at 8430 ft. in his Pacific Tube-Stewart No. 1 in Sec. 9-2s-12w. Gas blow was good on formation test of the interval of 8414-8430 ft., with recovery 6500 ft. of clean oil.

Athens Wildcat Grading Ground

Southern California Pet. Corp. is

Continental Oil Co.'s Bixby No. 3-2 in the Northwest Extension of the Seal Beach Field. Bell & Burden Contractors. Front row, left to right: M. Hackler, pipe racker; W. H. Pettigrew, cat head; M. R. Fox, rotary helper; rear row, left to right: Neal Norris, Drlg. Supt.; J. H. Nichols, driller; J. S. Cobb, tool pusher; Ray Nichols, derrickman.



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TO RELEASE a Bowen Safety Joint in the hole you need only rotate the drill string slightly to the left and lower until joint breaks. Then unscrew the two sections.

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Simple construction, plus simple, fool-proof operation eliminate the dangers of conventional complex Safety Joint design to make the Bowen Safety Joint dependable on the toughest drilling, testing and fishing operations.

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Standard Oil Co.'s Huntington Beach A-87, in the Huntington Beach field. Front row, left to right: Bob Plathon, rotary; K. E. Sigmund, rotary; rear row, left to right: W. R. Schmidt, rotary; J. C. Bruce, driller; H. C. Malloy, derrick.

grading ground for Block No. 86-1 test well, approximately 2700 ft. south and 1905 ft. east from the northwest corner of Sec. 12-3s-14w. This is south of Shell Oil Co.'s Moser Comm. No. 1 new discovery in the area.

Santa Ana Test Quits

After redrilling to 6290 ft. Tide Water Associated Oil Co. has abandoned Martin No. 1 wildcat in Sec. 21-5s-10w near Santa Ana Gardens in Orange County. A formation trial of the interval of 6200-6290 ft. showed a recovery of a 2200-ft. rise of salt water with some oil. The hole was carried originally to 6554 ft.

Newhall Try Works

Drilling is going forward at a depth of 9525 ft. in Bankline Oil Co.'s Newhall Corp. No. 1 wildcat in Sec. 31-4n-15w in the Newhall area. Mutual Development Corp. is making hole ahead at 2677 ft. with Sanborn No. 2 in Sec. 6-3n-16w. Near Castaic, L. R. Wilhite and Claude Kavanaugh are prospecting ahead at 1595 ft. with Wilhite-Jenkins No. 1 test in Sec. 18-5n-16w. Standard of California's Del Aliso No. 2 prospect job in Sec. 29-3n-16w in the Aliso Canyon area is digging at 4251 ft.

Dominguez Test Flows

Morton and Sons' Dominguez Estate No. 1 in Sec. 3-4s-13w in the Dominguez area at last reports was flowing by heads while mud was being washed from the bottom of the hole at 8144 ft. Blank liner was cemented from 7300 to 7800 ft. to protect bad place in 7-in. casing cemented at 7806 ft.

Lawndale Tests Go Ahead

Seaboard Oil Co., which recently opened up new deep production in the Lawndale field, is drilling Sea-Board-Comm. No. 6-1 in Sec. 20-3s-14w there at 5329 ft. The company's Pauley-Seaboard No. 61-20 in the section has cemented casing at 1595 ft., with present depth of the hole 1700 ft.

Inglewood Adds Well

Basin Oil Co. has another well

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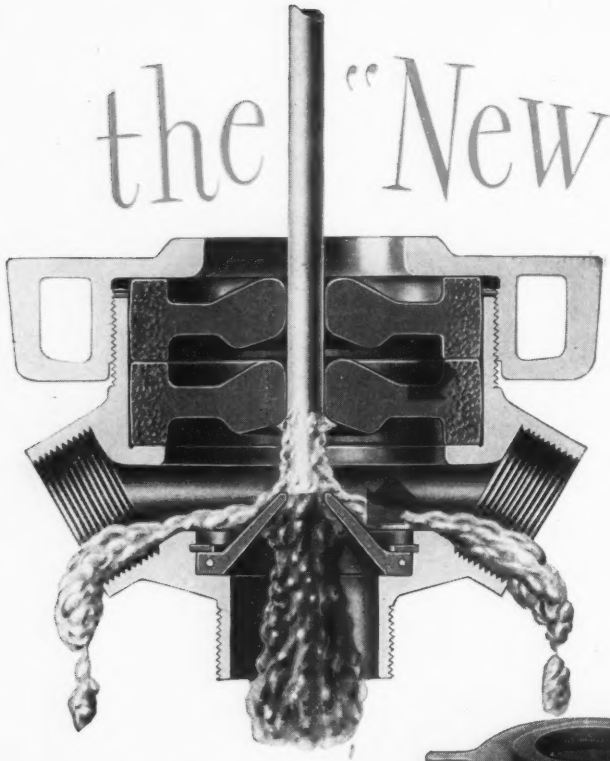

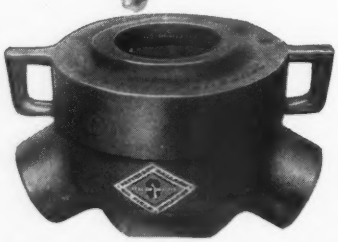

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in the Inglewood area. The newest producer is Inglewood Comm. No. 5-1 in Sec. 28-2s-14w. It came in from a finishing depth of 10,327 ft., flowing at the rate of 130 barrels of 29 gravity oil daily through a 11/64-in. bean. Gas yield was 1,400,000 cubic ft. a day. The shut off is at 9651 ft. Inglewood Comm. No. 7-1 in the section is drilling at 9878 ft.

Long Beach Active Area

General Petroleum Corp. is preparing to question above plug at 10,381 ft. its I.P.C. No. 4 in Sec. 29-4s-12w in the Long Beach area. Drilled to a total depth of 10,811 ft., trials so far failed to measure up to commercial standards. Shell Oil Co. has plugged its Hart Comm. No. 1 in the section at 9600 ft. following a test of perforations at 9637 ft., which was wet. Los Nietos Co. is plugging to sidetrack fish in its East Long Beach Comm. No. 1 in Sec. 33-4s-12w. Present depth is 5532 ft.

West Newport Venture Cased

D. D. and Dorothy Dunlap's Aldrich Land Co. No. 10 in Sec. 18-6s-10w at West Newport has 7-in. casing standing cemented at 4950 ft. Original bottom is 5540 ft., with plug at 5250 ft. Good oil sand was logged at 4690-4920 ft. and 4950-5250 ft. Madeline No. 1, sponsored by Donnelly-McGee in Sec. 28-6s-10w, is rigging to pump from a plugged back depth of 1500 ft. Shut off is at 1204 ft.

Richfield Test Spuds

R. L. Wheelock, J. L. Collins, J. S. Abercrombie and H. S. Porter have spudded their J. C. Travis No. 1 test in Sec. 31-3s-8w in the Richfield area, Orange County. Operations have been carried to a point at which surface pipe has been cemented at 300 ft. with hole down 307 ft.

Talbert Well Works

Shell Oil Co. is engaged in clean-out operations with Lamb Comm. No. 51-6 in Sec. 6-6s-10w at Talbert, a sequel to cementing 180 ft. of blank liner at 7832 ft. and gun perforating and testing. What the test may have disclosed is yet a company secret. Total depth is 7834 ft.

Brea Try Grading

Location is being graded for Shell Oil Co.'s Puente-Orange No. 1 test well in Section 3-3s-10w in the Brea area.

Beach Test Flows Water

Seguro Petroleum Co.'s Seguro No. 1 deep test in Sec. 34-5s-11w at Huntington Beach on open hole try flowed 300-degree F. salt water to sump at a rate estimated at 3500 barrels daily. Total depth is 9110 ft., with casing set at 7810 ft. Gas and oil showings were encountered at a number of levels.

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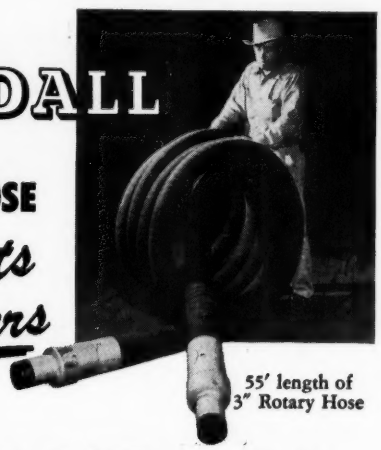

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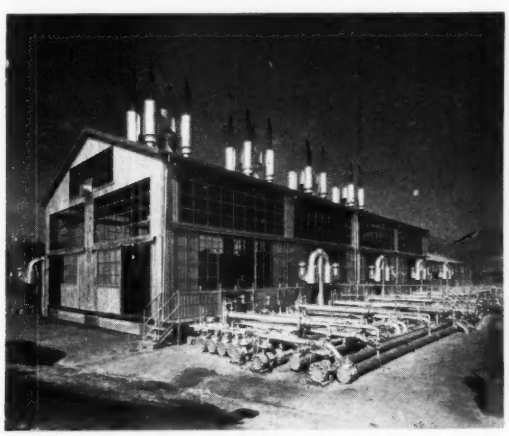

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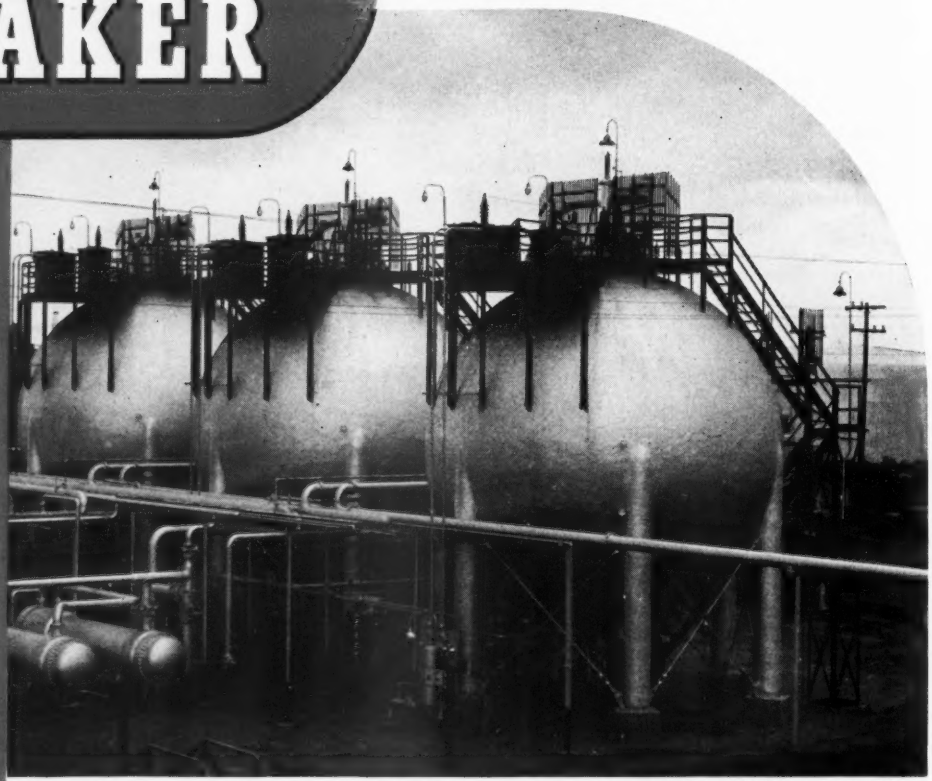

Courtesy Union Oil Company of California

A Petreco Electric Desalter doesn't exactly *shake* out the salt, but it sure gets rid of it—right now. Most Petreco desalters are getting 90% or better removal—98, 99 and 100% removal efficiencies are not unusual. Desalting eliminates the nuisance of frequent refining shut downs caused by salt plugging, hard coking and HCl corrosion. Desalting insures greater capacity, longer runs, and smoother operations. If you're having any salt difficulties, get in touch with us. We've helped some mighty good refining men shake the salt problem out of their hair. *The Petreco process is not expensive;* a Texas refiner recently figured his Petreco desalter paid off in less than six months. Get in touch with a Petreco engineer—he'll show you the figures!

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Coastal and Northern District

Point Arguello Lease Completed

Independent Exploration Co., which in the past has largely confined its leasing and drilling activities to Kern County, has stepped out and leased some 9000 acres on the Sudden Ranch near Point Arguello in Santa Barbara County.

The company already has conducted geological surveys in the area and sometime before summer a drilling program there is a strong probability.

A number of wells have been drilled on the Sudden Ranch. Viewed from the standpoint of the advanced technique associated with oil development today, these earlier test are considered more or less inconclusive.

Yolo County Test Starting

Shell Oil has made location for Meridian Unit No. 2-1 test in Sec. 17-9n-1e in the Meridian area of Yolo County. Harper No. 1 in Sec. 14-4n-1w in the Kirby Hills in Solano County is drilling ahead in quest for new gas supplies at 2913 ft.

Bardsdale Well Drills

Cleveland Oil Co. is drilling at 3167 ft. with Burson No. 1 in Sec. 6-3n-19w in the Bardsdale field. Four wells are to be drilled on the 40-acre lease there.

Padre Canyon Extended West

With the recompletion of its Hobson No. B-50 in Sec. 16-3n-24w, C.C.M.O. Co. has extended the Padre Canyon field to the west and proved for itself several new locations. Rate of production last reported was 324 barrels of 30 gravity oil through a 32/64-in. bean, cutting 13 per cent. Gas yield was 665,000 cubic feet. Total depth is 5260 ft. The perforated interval is 4140-4700 ft. Casing is set at 5259 ft.

Elwood Try Progressing

Progress with the drill at 3710 ft. is reported from J. W. Rice and Leonard Firestone's Firestone No. 3 wildcat in Sec. 14-4n-29w north of the Elwood field in Santa Barbara County.

Ojai Test Cores Ahead

Richfield Oil Corp. is coring ahead at 3113 ft. with Ojai No. 53 exploratory venture in Sec. 13-4n-22w near Ojai in Ventura County.

Olivera Canyon Wildcat Grades

Grading is under way for Pacific Western Oil Corp.'s Williams Holding Co. No. 1 wildcat in Sec. 18-9n-32w in the Olivera Canyon area, Santa Barbara County.

Huasna Test Going Deeper

Danciger Oil & Refining Co. is cleaning out to deepen Twitchell No. 1 wildcat test in Sec. 35-32s-15e in the Huasna area of San Luis Obispo County. Drilled to a total depth of 5109 ft., the project in recent weeks has been the subject of trials uphole by stages. The 7-in casing is set at 4062 ft.

San Ardo Try Starts

Texas Company has location staked for Rosenberg No. 3 in Sec. 34-22s-10e in the San Ardo area in Monterey County, with further activity there awaiting arrival of tools. The Jergins-North American Cons. Oil combination is bailing with McCool Three No. 2 in Sec. 10-22s-10e. Bottom is in granite at 1828 ft. Casing is set at 1712 ft.

Conejo Job Drills Ahead

On the spacious and picturesque Janss Ranch in the Conejo area, Ti-Bell Drilling and Roy, Inc. is drilling steadily ahead below 6900 ft. with No. 1 test in Sec. 33-2n-19w, Ventura County.

Saticoy Try Still Fishing

Superior Oil Co. at last reports was washing over fish in its Saticoy No. 1 wildcat in Sec. 10-2n-

D. D. Dunlap's Aldrich No. 10 in the West Newport Area. Front row, left to right: M. M. Frisbee, derrick; James E. Compton, lee tong; rear row, left to right: H. M. Renzelman, cat head; John James, pipe racker; J. J. Cox, tool pusher; Charlie Hamill, driller.

22w. Top of the stuck drill pipe is at 12,495 ft. and bottom at 12,951 ft. Present depth of the hole is 13,581 ft.

Lompoc Wildcat Grading Ground

In the Purisima Hills east of Lompoc, Union Oil Co. is grading for Crandall Government No. 1 in Sec. 11-7n-33w, Santa Barbara County. The project will explore to basement rock.

Zaca Wildcat Interrogating

Tide Water Associated Oil Co. is testing Davis No. 35 in Sec. 33-8n-31w in the Zaca area, after recementing following a water shut off trial, which was wet. Total depth is 3612 ft., with casing set at 3232 ft. Luton No. 93 in Sec. 32-8n-31w is grading.

Montalvo Well Digs

In the Montalvo area of Ventura County, Standard of California is drilling at 5826 ft. with Eastwood No. 1 in Sec. 33-2n-22w and at 4485 ft in McGrath No. 62-4 in Sec. 30-2n-22w. Richfield is drilling at 5823 ft. with Bailard-Mee No. 1 in Sec. 20-2n-22w.

Simi Test Rigging Up

Cal-Ven Petroleum Co. is rigging up Wickhorst No. 1 wildcat in Sec. 11-2n-18w in the Simi area in Ventura County.

South Mountain Explorer Drills

R. E. Havenstrite, Operator, is drilling at 830 ft. in Price No 1. wildcat test in Sec. 19-3n-20w in the South Mountain area. Price No. 1 in the section, a recent completion, is producing 195 barerls of 24.6 gravity oil daily from 5250 ft.

Gato Ridge Test Drills

Drilling has reached a depth of 4932 ft. in General Petroleum Corp.'s Price No. 1 in Sec. 18-8n-32w near the Gato Ridge field. Prospecting is continuing ahead.

Goleta Test Cements Pipe

The 7-in. casing has been set at 6426 ft. and now standing cemented is Honolulu Oil's Honolulu-Signal-Macco State No. 309-2 in Sec. 19-4n-28w in the Goleta area. Original bottom is 6920 ft. and plugged back depth 6690 ft.

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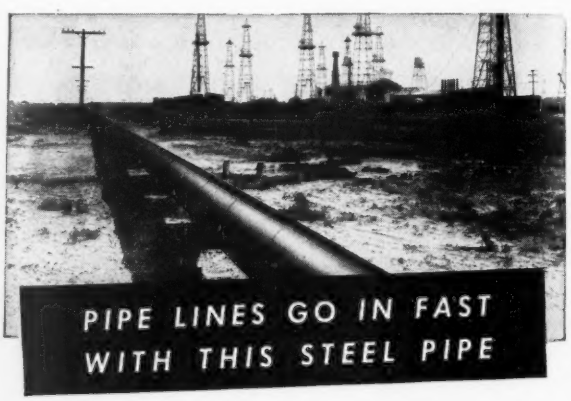

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ARMCO WELDED STEEL PIPE

San Joaquin Valley

Arvin Venture Rerunning Test

In the Arvin area, British-American Oil Prod. Co. and the Capital Co. are preparing to rerun formation test of the interval of 7890-7915 ft. in their Arvin Comm. No. A-47 in Sec. 26-31s-29e. The first test was inconclusive. The well is bottomed in an interesting oil sand at 8638 ft. Bolsa Chica Oil Corp. is understood planning to start its De Giorgio Ranch No. 1 deep test in Sec. 4-29s-28e northwest of Arvin when the strike of agricultural workers in the area is settled. Standard of California is rigging pump to its Tupman No. 2 in Sec. 22-31s-29e. Total depth is 7567, with plug at 7505 and casing set at 7411 ft. Indications are that the idle Louis H. Didier well in Sec. 10-31s-30e may soon be deepened from present depth of 2247 ft.

Wheeler Ridge Wildcat Starts

Texas Company jointly with Independent Exploration Co. is starting another test well on wildcat ground south of the Wheeler Ridge field. Location falls approximately six miles west of the combination's abandoned KCL No. 26-21, which found nothing of commercial interest to 3500 ft. The new undertaking has been tagged K.C.L. No. 6-2 and is on Sec. 6-10n-20w.

Buena Vista Test Deeper

Western Gulf Oil Co.'s B.V.A. No. 18-3 in Sec. 3-32s-25e in the Buena Vista area is making progress with the drill at 8683 ft. U.S.-Case Comm. No. 1 in Sec. 23-11n-23w is idle. The hole went to 3483 ft. before redrilling to 3048 ft.

Raisin City Try Logging

Electric log is being run in Real Oil Co.'s San Joaquin No. 1 exploratory hole in Sec. 11-15s-17e in the Raisin City area. Redrilled depth is 5200 ft. and original bottom 6430 ft.

Paloma Try Drilling On

Ohio Oil Co.'s wildcat effort in the Paloma area is drilling at 9683 ft. The venture is labeled KCL-B No. 41-30 and is in Sec. 3-31s-26e.

Terra Bella Test Starts

Hudson Oil Co., has staked location for Say No. 1, a wildcat test in the Terra Bella area in Sec. 24-22s-27e, Tulare County.

Tejon Test Rigs Pump

Rigging to pump is Drilling & Prod. Co.'s J. V. No. 77-32 in Sec. 32-11n-19w in the Grapevine-Tejon area. Total depth is 2627 ft., with casing set at 2562 ft. No. 76-32 in the section is rigging up.

Temblor Test Grows Deeper

In the Temblor area in San Luis Obispo County, Continental Oil Co. is drilling at 3384 ft. with British-American-Dodds-Thomas Unit No. 1 in Sec. 22-30s-20e. On the San Emigdio Ranch, Continental is drilling at 9342 ft. with Santiago No. 1 in Sec. 8-11n-22w. K.C.L. No. L-2 in the section is coring at 12,927 ft. K.C.L. No. O-1 in Sec. 9-31s-26e near Buena Vista is drilling at 7553 ft. The latter is designed to test both the Vedder and Lower Stevens.

Sharktooth Well Pumping

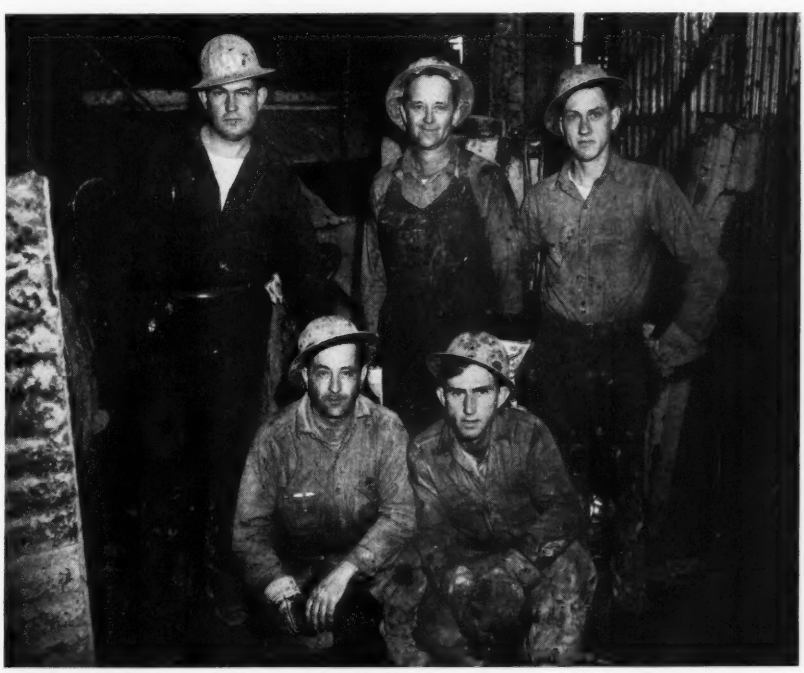
Barnsdall Oil Co. has finished at 2751 ft. its E.P.M. No. 2 in Sec. 15-28s-28e at Sharktooth. Present output rate is 62 barrels of 12.9 gravity oil a day, cutting 4.5 per cent. The well is pumping from a total depth of 2751 ft. E.P.M. No. 3 in the section is drilling at 1333 ft.

Comanche Test Gives Up

A. J. Crevolin and J. H. Novelli have abandoned their No. 1 wildcat in Sec. 32-12n-18w in the Comanche Point area. The project explored to a bottom of 2260 ft. in weathered granite.

Cuyama Valley Wildcat Drills

Navy Oil Co., the most recent en-



Southwest Exploration Co.'s Huntington Beach J-51, in the Huntington Beach field. Front row, left to right: W. M. Gilmore, cat head; L. R. Parsley, lee tong; rear row, N. L. Crooks, driller; H. C. Yount, pipe racker; F. L. Hutain, derrick.

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In the Paloma Field at Superior Oil Co.'s well, Anderson 45-35. Front row, left to right: Eddie Lemon, floorman; David Hense, floorman. Rear row, left to right: Thomas Nelson, derrick; E. B. Kisbey, driller; John Nugent, Jr., cat head; D. J. Campbell, back up.

trant to the Cuyama Valley play, is drilling at 1520 ft. with Kirschenmann No. 1 in Sec. 12-10n-27w. F. R. Anderson & Associates have abandoned Hadley No. 1 in Sec. 25-11n-28w at 2165 ft.

McDonald Try Rigging Up

San Joaquin Exploration Co. is rigging derrick to start the drill in Layman No. 7 test in Sec. 12-28s-19e in the McDonald Anticline area.

Paloma Try Digs

Richfield Oil Corp.'s M. & L. No. 78-24 in Sec. 24-31s-25e in the Paloma area is making progress with the drill at 10,783 ft. Richardson No. 1 in Sec. 18-29s-21e near Salt Creek is drilling at 7332 ft.

Sharktooth Well Pumps

Independent Exploration has completed Swan No. 2 in Sec. 15-28s-28e in the Sharktooth area, pumping at present 102 barrels of 12 gravity oil daily, cutting 17 per cent. The well was finished at 2740 ft. In the McFarland area, the Company has location staked for Wright-Bloemer No. 1 wildcat in Sec. 11-26s-26e. Gravett No. 1 in Sec. 32-27s-19e in the Shale Hills area has been abandoned at 1540 ft. The Point of Rocks was topped at 1306 ft.

McKittrick Well Testing

Texas Co. continues to test uphole by stages with Westpet NCT One No. 87-29 in Sec. 29-30s-22e in the McKittrick area. Total depth is 7905 ft., and casing is set at 7678 ft. Westpet NCT One No. 15-29 is a location in the section. Voight Two No. 1 in Sec. 32-27s-20e in the Antelope area is drilling at 4785 ft. The company, meantime, is starting Hogan No. 1 in Sec. 4-31s-29e in the Mountain View area.

Globe Anticline Explorer Drills

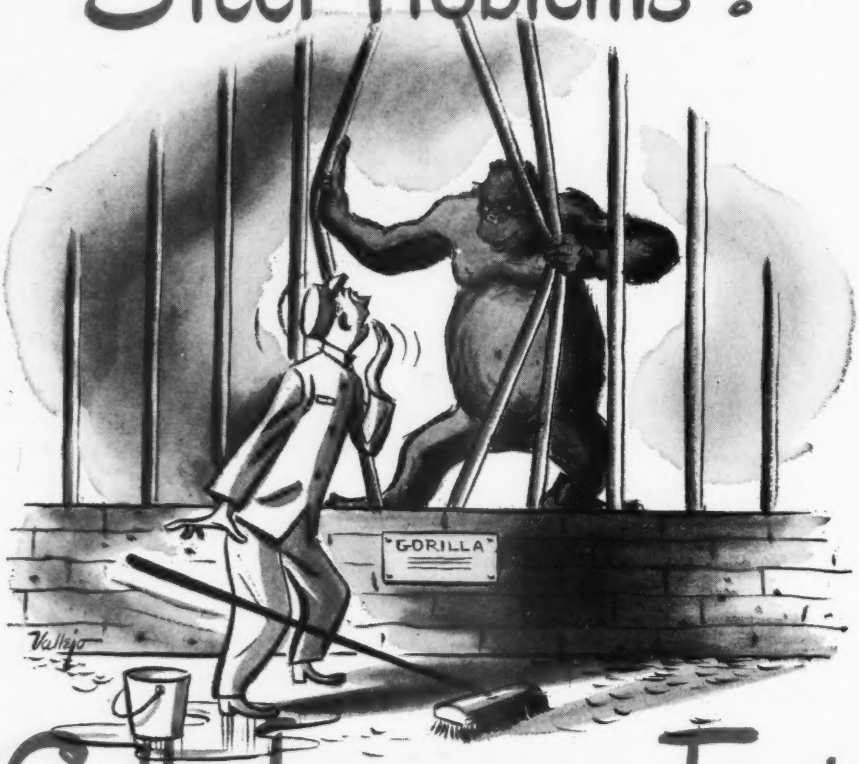
On the Globe Anticline near the Midway-Sunset field, Shell Oil Co. is prospecting ahead at 5156 ft. with Vedder-USL No. 1 in Sec. 9-31s-22e.

Kettleman Hills Venture Drilling

Standard of California should get some sort of an answer soon from its S.F. & F.L. No. 4-2 test in Sec. 12-25s-19e at Kettleman Hills South Dome, which continues to drill at 10,852 ft. The company has under consideration a program of several wells for the Middle Dome area, where some months ago it scored a new discovery in the

Drilling & Exploration Co., contractors on a Western Gulf Oil Co. well in the Paloma Field. Front row, left to right: L. W. Austin, back up; M. G. Curtis, lee tong; H. M. Neal, cat head; left to right, rear row: W. R. Hazlip, fireman; L. R. Terry, derrick man; M. C. Phelps, driller.

Steel Problems?



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Eocene. In the Lost Hills area, Standard's Van Sicklen No. 45 wildcat in Sec. 36-27s-21e is down 5580 ft. and washing over fish.

Edison Wildcat Spot Cores Ahead

General Petroleum Corp. is drilling and spot coring at 3901 ft. with Cottonwood-So. Cal. No. 22-30 near Edison in Sec. 30-29s-30e. Berry No. 11-15 prospect job in Sec. 15-28s-20e in the vicinity of Shale Hills is drilling at 8360 ft. Ninkovitch No. 62-9 in Sec. 9-30s-21e in the McKittrick area is drilling below 9350 ft.

McKittrick Test Listed

On the Dollar Anticline near McKittrick, Union Oil Co. has staked location for R.K. No. 1 test in Sec. 34-30s-21e, Kern County. In the Cymric field, Union is rigging to pump from 905 ft. its Gamble No. D-2 in Sec. 6-30s-22e. All oil was swabbed.

Edison Test Flows By Heads

First National Finance Corp.'s DeMille-First National-Jeppi No. 1, which evidently made a fault block discovery in Sec. 17-30s-29e near Edison, flowed by heads 200 barrels of clean oil in 18 hours after sand was circulated out. Drilled to a total depth of 3449 ft., the well sanded up shortly after going on pump. A followup job, DeMille-First National-Biggar No. 1, is building rig in the section.

Loffland Bros. contractors on the Western Gulf Oil Co. well No. 32-29 in the Paloma Field, front row, left to right: A. B. Sloss, fireman; M. N. Smith, cat head; rear row: John Vandivert, driller; Garland Newberry, derrick; "Doc" Tyree, lee tong.

In the Paloma Field at Western Gulf Oil Co.'s well No. 65-34, Rocky Mountain Drilling Co., contractors. Front row, left to right: J. E. Doty, pipe racker; D. E. Jones, cat head; W. H. McDowell, derrick; rear row, left to right: C. E. Parker, lee tong; C. J. Gibson, tool pusher; N. C. Burnham, driller.

San Emigdio Well Pumping

On the west side of the San Emigdio Ranch, Apex Petroleum Corp.'s new well at last reports was pumping at the rate of 30 barrels of 28 gravity oil daily, cutting 1 per cent. The well, known as Los Lobos No. 3 and located in Sec. 5-10n-22w, came in at 1481 ft. for an initial yield of 75 barrels a day, cutting 10 per cent.

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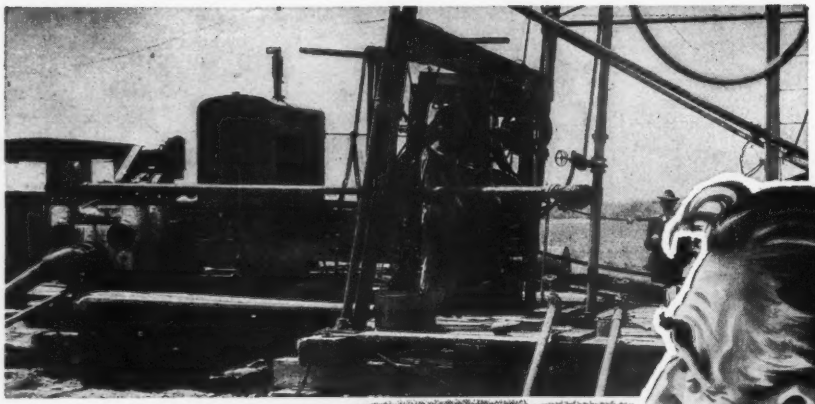
California Oil World's Monthly Summary

CALIFORNIA DEVELOPMENT AND PRODUCTION

	JANUARY, 1948 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First Month	Daily Average January 1948	Daily Average January 1947
SAN JOAQUIN VALLEY REGION						
Ant Hill					1,161	1,591
Antelope Hills					1,270	1,435
Bellevue					318	300
Belridge—North					3,794	5,335
Belridge—South	3	6	241	6	6,008	9,901
Blackwell's Corner					131	205
Buena Vista Hills	1				46,215	48,158
Canal					1,945	1,990
Coalinga Group						
Eastside	2	4	204	4	18,699	16,016
Oil City					81	107
Coalinga—Nose					52,993	52,500
Coalinga—Northeast	2				8,300	7,523
Pleasant Valley					3,904	3,627
Jacalitos	1	1	302	1	4,915	4,265
Westside	2				6,807	6,638
Coles Levee—North	2				16,321	16,336
Coles Levee—South	2				3,155	2,344
Edison	3	1	297	1	10,744	12,477
Elk Hills	4	1	188	1	6,084	8,018
Fruitvale					6,073	7,157
Greeley					13,960	10,049
Helm	1				4,068	4,217
Kern Bluff	3	3	134	3	281	
Kern Front	4	6	276	6	8,853	8,580
Kern River	13	31	974	31	11,589	9,272
Kettleman North Dome	3	1	245	1	35,720	37,391
Lanare					1,367	2,498
Lost Hills	4	14	899	14	6,501	3,973
McKittrick Group						
Belgian Anticline	2				1,096	
Cymric	6	6	365		18,022	12,192
McKittrick					2,795	2,870
McKittrick Front		2	23	2	1,448	1,591
Salt Creek					6,023	3,210
Sheep Springs					1,415	399
Temblor Ranch					100	114
Midway-Sunset	4	8	383	8	42,658	42,451
Mt. Poso Group	1	2	104	2	13,288	15,332
Mountain View		1	70	1	4,021	4,572
Paloma	7	5	2,023	5	11,271	7,428
Poso Creek Group		3	184	236	3,664	3,386
Pyramid Hills					242	271
Race Track Hill	2				1,743	2,142
Raisin City					2,913	2,692
Rio Bravo					12,559	13,115
Riverdale					3,669	4,014
Round Mountain Group	4	1	114	1	7,772	9,029
Strand					886	1,423
Strand—East					506	463
Tejon Ranch	1				3,547	2,470
Ten Section	1				7,360	7,822
Union Avenue					352	343
Wasco					133	467
Wheeler Ridge					216	226
Other Fields	1	7	1202	1	1,367	306
TOTAL—San Joaquin Valley Region	79	103	8228	103	430,323	420,231
COASTAL REGION						
Santa Maria District						
Barham Ranch (Los Alamos)					11	
Casmalia		1	24	1	864	231
Cat Canyon—East					367	46
Cat Canyon—West	3	3	873	3	14,121	8,539
Four Deer	1	1	164	1	456	
Gato Ridge					3,696	3,653

	JANUARY, 1948 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First Month	Daily Average January 1948	Daily Average January 1947
COASTAL REGION—Continued						
Lompoc	3	3	654	3	5,566	2,807
Olivera Canyon					319	
Orcutt	1	4	170	4	4,931	4,132
Santa Maria Valley	1	1	10	1	21,737	29,870
Tinaquaic						
Zaca Creek	2				769	395
Santa Barbara District						
Capitan					2,980	3,209
Elwood	2				7,244	7,084
Santa Barbara					67	70
Summerland						2
Ventura District						
Montalvo West		1	84	1	169	
Padre Canyon	1	1	399	1	4,562	2,632
Rincon	1				3,329	4,169
San Miguelito	1	1	353	1	5,061	5,157
Ventura Avenue	7	1	45	1	51,102	45,375
North Santa Clara District						
Del Valle	3	2	459	2	9,109	7,272
Hopper Canyon					210	233
Oak Canyon					1,822	1,705
Sespe Canyon Group	1				181	324
Temescal					547	569
Others	1	1	150	1	479	188
South Santa Clara Valley District						
Aliso Canyon		2	1,365	2	3,437	3,041
Bardsdale	2				454	420
Newhall-Potrero	3				6,264	5,863
Oxnard					1,476	751
Shiells Canyon	1				956	1,057
South Mountain	3	2	317	2	5,141	4,480
West Mountain		2	409	2	1,000	223
Others	1				869	603
San Luis Obispo, Santa Barbara, Santa Clara and Monterey Counties					200	30
TOTAL—Coastal Region	38	26	5,476	26	159,496	144,130
LOS ANGELES REGION						
Brea-Olinda	3	2	135	2	13,483	11,424
Coyote—East					4,892	4,731
Coyote—West	3	1	133	1	15,393	14,839
Dominguez	1				14,111	15,183
East Los Angeles	2				1,114	779
El Segundo					409	528
Huntington Beach	19	22	2,234	22	53,911	47,920
Inglewood	2	1	134	1	11,394	12,225
Long Beach	10	1	100	1	23,098	23,825
Montebello					6,962	7,690
Newport	3	1	133	1	6,122	7,734
Playa Del Rey					1,964	2,273
Potrero	2	1	182	1	985	679
Richfield	1				6,419	6,726
Rosecrans-Athens Group	3	1	52	1	4,559	4,807
Santa Fe Springs	1	1	14	1	15,634	16,150
Seal Beach	3	1	68	1	10,935	10,666
Torrance		1	25	1	7,931	8,528
Whittier					953	1009
Wilmington	16	27	6,517	27	138,118	120,304
Yorba Linda	1				1,076	195
Other Fields	3				1,671	1,332
TOTAL—Los Angeles Region	73	60	9,727	60	341,134	319,557
EXPLORATORY						
Outpost Wells	36					
Wildcats	12					
Gas Wells	2	8		8		
TOTAL CALIFORNIA	238	189	23,431	210*	930,953	883,918

*Includes 21 drilling wells abandoned.



Shown at left is a typical early Wilson Rig, which you'll still find in operation today.

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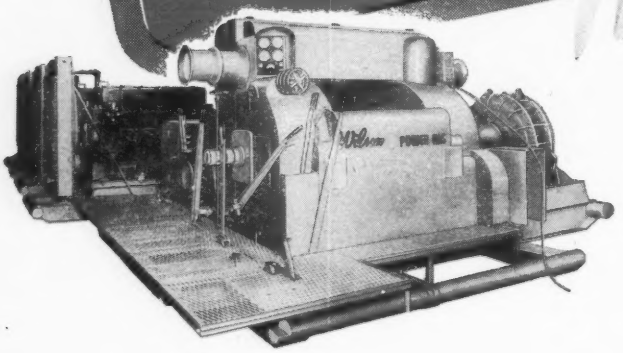

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Personalities IN THE NEWS

Lane-Wells Announces Field Personnel Changes

In order to handle more efficiently the record increase in volume of business, Lane-Wells Company has made the following changes and reassignments in field personnel, according to Morton T. Higgs, Manager of Field Operations.

R. B. Downing

R. B. Downing has been appointed Mid-Continent Division Manager following the resignation of R. B. McCullar from that position. "Ike" Downing joined Lane-Wells in 1941 after previous experience as Kansas Division Geologist of Barnsdall Oil Company, and as a Consulting Geologist with headquarters in Wichita, Kansas. Downing's experience with Lane-Wells includes service as Sales Engineer, Geologist, Superintendent of the Oklahoma City District, and Division Sales Manager.

C. L. Kirkman, formerly Assistant District Superintendent at Great Bend, Kansas, succeeds Downing as Division Sales Manager in Oklahoma City. R. H. Waggoner, formerly Sub-District Superintendent in Russell, Kansas, has been transferred to Great Bend to succeed Kirkman; and A. N. Downing, formerly Gun Perforator Operator in Russell, has been made Sub-District Superintendent.

L. V. Steffey, formerly Assistant District Superintendent in Oklahoma City, has been transferred to Salem, Illinois, as District Superintendent, succeeding R. G. Echols resigned. E. C. Doane, formerly Sub-District Superintendent at Seminole, Oklahoma, has been appointed to Steffey's former position; and Sidney R. Pittman, formerly an Operator in Healdton, Oklahoma, has succeeded Doane.

Other recent changes include the advancement of J. D. Dunigan from the position of Sub-District Superintendent at Guymon, Oklahoma, to District Superintendent at the same point, and the transfer of Ray Edwards, formerly Operator in Charge at the Ulysses Truck Station, to the position of Sub-District Superintendent of the recently established Garden City, Kansas Sub-District.

In the Gulf Coast Division, E. A. Radack, formerly Sub-District Superintendent at Laurel, Mississippi, has been moved to Shreveport, Louisiana, as Assistant District Superintendent.

J. C. Strickland, formerly Operator in Charge of the Opelousas, Louisiana Truck Station, replaced Radack; and J. C. Orr has replaced Strickland.

Leon Pyle has been made Operator in Charge of the new Monroe, Louisiana Truck Station.

E. F. Stokes has been made Operator in Charge of the new Lubbock, Texas Truck Station.

Richard Fenton of the California Stripper Well Association has been elected commodore of the Southern California Yachting Association. He also is commodore of the Balboa Yacht Club and president of the International 14-ft. Sailing Association.

J. B. TAYLOR, CHAIRMAN, C.N.G.A. BY-LAWS REVISION COMMITTEE

Mr. Taylor, a graduate of Stanford University is one of the older members of C.N.G.A. holding membership card number 200. Since becoming a member in 1927, Mr. Taylor has been a member of many of the Technical Sub-Committees and served as General Chairman of the Technical Committee in 1943.

At present Mr. Taylor is Assistant Manager of the Gas Department of the Signal Oil & Gas Company and in addition to serving as chairman of the By-Laws Revision Committee is a member of the association's Executive Committee and Board of Directors.

E. A. Cunningham, manager of public relations for Shell Oil Co., discussed "How Public Relations Ties In With Advertising" at the meeting of the Northern California Industrial Advertisers Association in St. Julien's Restaurant at San Francisco.

Morton N. D'Evelyn, widely known consulting geologist, has established new offices at 121 Chester Ave., Bakersfield. He will specialize in Mountain View engineering and geology. He was associated with Hogan Petroleum Co. in the early development at Mountain View.

SECURITY QUIZ

for MANAGEMENT MEN

can you answer these important questions?

How many of your employees are buying U. S. Security Bonds regularly via the Payroll Savings Plan? (35% to 50% of employees buy Security Bonds on the Payroll Savings Plan in those companies in which top management backs the Plan.)

• *How does their average holding compare with the national average?* (The national average among P.S.P. participants is $1200 per family.)

• *Why is it vital—to you, your company, and your country—that you personally get behind the Payroll Savings Plan this month?* You and your business have an important stake in wise management of the public debt. Bankers, economists, and industrialists agree that business and the public will derive maximum security from distribution of the debt as widely as possible.

Every Security Bond dollar that is built up in the Treasury is used to retire a dollar of the national debt that is potentially inflationary. Moreover, every Security Bond held by anyone means fewer dollars go to market to bid up prices on scarce goods.

• *Can't your employees buy Bonds at banks?* Banks don't provide Security Bonds on the "installment plan"—which is the way most workers prefer to obtain them. Such workers want and need Payroll Savings.

• *What direct benefits are there for your company?* In 19,000 industrial concerns operating Payroll Savings, employees are more contented. Worker production has increased, absenteeism has decreased—even accidents have been fewer!

All these benefits accrue *in addition* to extra security for the individual who gets and holds Bonds. (Every $3 invested pay $4 at maturity.)

But even a plan with all these benefits requires the sponsorship of top management for real success.

• *What do you have to do?* The Treasury has prepared a kit of material especially for you to distribute among certain key men in your company. This will be your part in the all-out campaign—starting April 15—for *America's economic security.*

Make sure you get your kit. Be sure to give it your personal attention. Keep the Payroll Savings Plan operating at its full potential in your company. It's a major factor in America's security—*your best business security!*

For any help you want, call on your Treasury Department's State Director, Savings Bonds Division.

The Treasury Department acknowledges with appreciation the publication of this message by

CALIFORNIA OIL WORLD

This is an official U. S. Treasury Advertisement prepared under auspices of the Treasury Department and the Advertising Council

Champion Forge Appoints District Steel & Equipment Co.

Appointment of District Steel & Equipment Co., 4356 District Blvd., Los Angeles, as excusive California distributor for Champion forgings, is announced by Frank R. O'Donnell, General Manager of Champion Forge Co., Cleveland, Ohio, operators of one of the largest forging plants in the United States.

Van Rensselaer - Lacke

In making the announcement, O'Donnell stated that, through the new outlet, his company is offering California customers the complete Champion forging service, from steel analysis to and including final heat-treatment. The Ohio company, which makes drop and upset forgings weighing up to 2000 pounds, is equipped with forge hammers from 1000-pound board up to 35,000-pound steam capacity. In addition to supplying railroads, automobile plants, oil companies and many other industries requiring heavy forgings, the company has specialized in oleo strut and other aircraft quality forgings for the aircraft industry.

The District Steel & Equipment Co., was established in Los Angeles by F. J. Lacke and J. R. Van Rensselaer, two former Cleveland men, who came to the West Coast shortly after the end of the war. Lacke, who served in the Navy as Lieutenant Commander in Bureau of Aeronautics during the war, was previously connected with the Ford Motor Company in Detroit, Chicago and Cleveland. Van Rensselaer, a native of Los Angeles and a graduate of the University of California in the year 1925, was a representative of Taylor Wharton Iron & Steel Co., in the Middlewest prior to the war. He served in the Ordnance Department and as a member of General Chennault's staff in China in World War II, holding the rank of Lieutenant Colonel.

Their company already represents several other large eastern organizations, including Tube Methods, Bridgeport, Pa., specialists in stainless steel tubing; and Taylor Wharton Iron & Steel Co., High Bridge, New Jersey; and they are distributors for Alloy Rod Co., York, Pa., and Hamilton Caster & Manufacturing Co., Hamilton, Ohio.

Prof. Morris Neiburger of the department of Meteorology at U.C.L.A. spoke on "Long Range Weather Forecasting" at the meeting of the Branner Geological Club in the Hancock Foundation Building of the University of Southern California.

Thomas W. Simmons, president of Bolsa Chica Oil Corp., has returned to his desk in the Richfield Building in Los Angeles from a vacation tour of leading cities in the Latin-American countries.

President Fred G. Gurley and other Santa Fe Railway officials were honored at a banquet in Los Angeles, celebrating completion of 100,000,000 miles of Diesel locomotive operations by Santa Fe. The banquet was attended by 1200 leading businessmen of Southern California. Comedian Bob Hope was master of ceremonies.

Union Oil President Reese H. Taylor is on a business tour of Eastern cities. He plans to return to Los Angeles by April 1.

H. H. (Bob) Roberts, manager of public relations for Standard of California in Los Angeles, was host to members of the Los Angeles press during open house at the California Research Corp.'s new laboratory at Richmond. CRC is a Standard subsidiary. Bob escorted the newsmen to the northern city and back again to Los Angeles via the popular Southern Pacific "Lark."

Don E. Gilman, executive vice president of the Western Oil and Gas Association, addressed the American Machine Tool Distributors' Association at the Biltmore Hotel. His topic was "The Outlook for Oil in 1948."

Russ Waters Joins Renfro Products

Thomas L. (Rufnex) Renfro of Renfro Products Company announces the appointment of Russ Waters as Sales Manager of the Oil Field Division of his company.

Russ Waters

Russ Waters needs no introduction to the oil men of California nor to the oil men of other sections of this industry, having for many years been operating as sales engineer for large manufacturing concerns. In addition to his selling he has been identified with oil industry association activities.

Renfro Products Company is the exclusive oil industry West Coast distributors for the Hinderliter Tool Co., McKissick Products Corp., Langdon Tent and Awning Co., and Southern Calif. exclusive distributors for the entire welding equipment line of the Westinghouse Electric Corp.

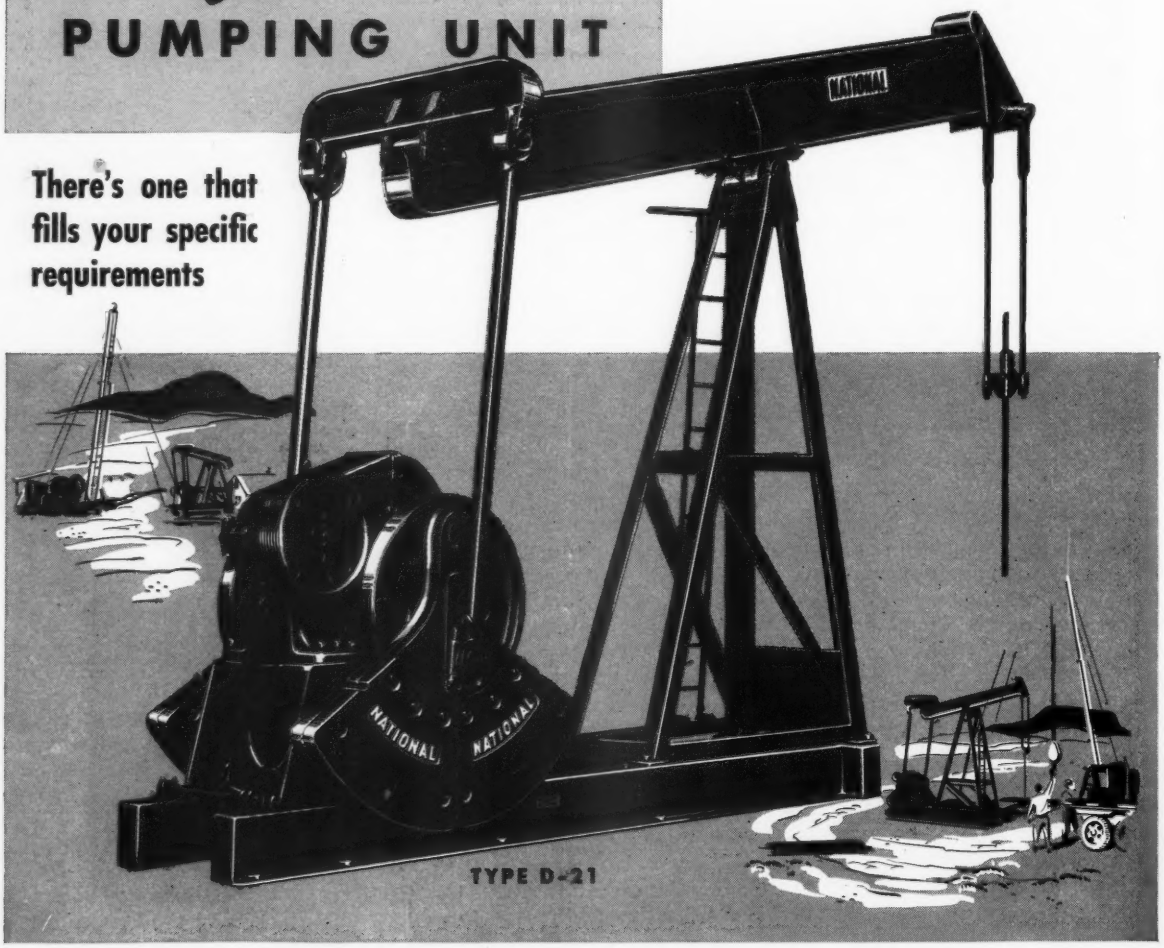
In addition to the above exclusive representation the Renfro Products Company handles the plug valves of the H. K. Porter Co., Inc., the industrial rubber products of the B. F. Goodrich Co., Columbia Steel Wire Rope, Great Western Cordage, Inc., and other well known items.

Mr. Waters will headquarter at the main offices of the company, which are located at 2417 Porter Street, Los Angeles.

Maintain Maximum Economy in all Pumping Operations

with a *National*
PUMPING UNIT

There's one that fills your specific requirements



National offers you twelve-size Pumping Units with structural ratings from 3,000 to 32,000. From this most comprehensive combination of specifications available to the industry, you can select the pumper for your specific requirements.

And when you put that "selected" National Pumping Unit to work, you will find that its simple design and precise construction gives profitable pumping performance day in and day out without interruption. Write for bulletins that describe the design and construction of the complete National Pumping Unit Line.

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NATIONAL BLUE PRODUCTS

THE INDUSTRY'S MOST COMPLETE LINE OF OIL FIELD EQUIPMENT

Charles S. Garvin, formerly resale department manager for Shell Oil in the company's Sacramento division, has been appointed assistant advertising and sales promotion manager of the company. This was announced by J. G. Jordan, marketing vice president.

James Little, 62, a member of the Kettleman North Dome Association in the Coalinga area, who died some weeks ago, left an estate of approximately $55,000 in cash and bonds, according to the Public Administrator at Hanford. He was unmarried and is survived by two brothers, Walter and Andrew Little of Berriedale, Caithnessire, Scotland.

W. H. (Bill) Geis and Bill Strang were the principal speakers at the meeting of the petroleum chapter, Southern California section, American Institute of Mining and Metallurgical Engineers. Geis spoke on the registration act. He is a consultant and petroleum representative, board of examiners, State Board of Registration for Civil and Petroleum Engineers. Strang, national secretary of the petroleum division of AIME, spoke on the "Outlook for 1948."

Appointment of Rush M. Blodget, executive vice president of the Oil Producers Agency of California, to the National Petroleum Council, was announced in Washington. Interior Secretary Krug at the same time reappointed Richard Fenton, executive vice president of the California Stripper Well Association, to the council for another year.

Bethlehem Opens New Office

The Bethlehem Supply Company of California recently announced the opening of their new general offices and main warehouse by holding "Open House" for the trade. The new modern office building and large warehouse are located at 6000 Alcoa Avenue in the Vernon District of Los Angeles.

Wendell Jones, Vice President and General Manager pointed out that the new facilities will enable Bethlehem Supply to better coordinate all operations and increased inventories will result in better service to their many customers in the Petroleum industry. The company also operates ten field stores located in the major California oil fields as well as offices and warehouses in San Francisco.

Local officers of the Los Angeles Chapter of Nomads: standing, left to right: R. M. Landis, John Rife, Fred Ripley, Jerry Engstrand, Lee Laird: kneeling: Bob Eiche, Earl Boggess, John Flanigan.

Frank O'Neill Made Assistant To The President of M. O. Johnston Oil Field Service Corporation

Frank E. O'Neill, veteran oil man, has been promoted to the position of assistant to the President of the M. O. Johnston Oil Field Service Corporation. O'Neill has been active in the oil business in California since 1920.

Starting with the oil department of Southern Pacific Railroad he served Pacific Oil Company, Standard Oil Company and Superior Oil Company. In 1933 he became associated with M. O. Johnston and served this organization as General Manager until 1938 when he formed his own oilfield research and development business. During the war O'Neill spent 4½ years at U.S.C. as a special lecturer on petroleum engineering. Two years ago he rejoined the Johnston organization as Chief Engineer. In his new position as assistant to the President he will coordinate service operations, manufacturing, sales, engineering and the business aspects of Johnston's rapidly expanding business.

Spang-Chalfant Issues New Bulletin

Oil Well Casing. Bulletin 352, 20 pages, 8½ x 11. Eight reasons for using Extreme Line Casing, Spang-Chalfant's solution of the problems encountered in completing the deepest oil wells, are featured. Another feature is casing clearance tables in three colors to distinguish extreme line casing dimensions from those of A.P.I. casing, and clearances between standard bits and inside of casing from clearances between couplings or joint O.D.'s and open holes. A quick design chart for 7-in O.D. casing combination strings is included also, as well as a tabulation of Extreme Line Casing weights and sizes. Copies are available from the Spang-Chalfant Division of The National Supply Company, P.O. Box 298, Pittsburgh, Pa.

With Drilling Contractors

Engineers of the Battelle Memorial Institute in Columbus, Ohio, have completed six weeks of a preliminary field trip in oil areas of the Permian Basin region of West Texas.

The trip was in the interest of the American Association of Oilwell Drilling Contractors, which has retained Battelle to conduct research on methods of non-destructively testing oil well drill pipe.

The purpose of such research is seen by the association as developing improved inspection methods and equipment which will be helpful to drill pipe inspectors. To be useful, the association explained, equipment should contribute to the speed and reliability of inspection and be practical for use in the oil field or in the mill.

Battelle engineers on their tour discussed inspection problems with drilling contractors, superintendents and engineers. Also inspection company representatives, field crews, suppliers of drill pipe and with others who could aid in establishing the needs and aims of the AAODC research program.

Commenting on the record use of petroleum products current in the United States, Brad Mills, executive vice president of the American Association of Oilwell Drilling Contractors, said it is conceivable that new discovery methods and improved drilling operations will bring about a type of development not now anticipated.

It has been difficult in the past to foresee such oil discoveries as Kettleman Hills, East Texas, Oklahoma and other major fields, but in

Pictures taken at the recent meeting of the A A.O.D.C. Above, H. J. Gibson, Lou Whipple and Clyde Simpson.

H. G. Haney and Hal Jordan.

Tine Gaiser, W. F. Jones, newly appointed secretary of the California Chapter, A. S. Hayes, E. C. Brown, national president.

Doug Graham, E. C. Brown, A. S. Hayes, W. F. Jones, Tine Gaiser.

one way or another these discoveries have been brought about, he stated.

The association executive pointed out that the drilling contractor fits closely into the petroleum industry's effort to give the consuming public the necessary oil at a fair price.

He said that it behooves every operator in the contract drilling segment of the industry to assume some responsibility for meeting the prevailing oil shortage.

Appointment of Gene Reid as contractor on B. C. Mackey's Vedder test well in Sec. 16-28-28 at Round Mountain, was recently announced.

Clyde Hall, contractor, is drilling Kirschenmann No. 1 for Navy Oil Co. in Sec. 1-10n-27w in Cuyama Valley.

Fowler Drilling Co. has the contract to drill Travis No. 1, sponsored by R. L. Wheelock, J. L. Collins, J. S. Abercrombie and J. L. Porter on a 150-acre lease in Sec. 24-3s-9w in the Kraemer area.

Headquarters of the recently organized Thornbury Drilling Co. are at 510 So. Spring St., Los Angeles. The company has acquired from William Thornbury, Inc., two rigs capable of drilling to 6500 ft., and two Blitz rigs rated at 5000 ft. William M. Thornbury is president of the company, W. H. Geis, vice president, and Fred Bryce, secretary-treasurer.

Brown Drilling Co. has been assigned contract to drill Porter No. 1 in Sec. 21-30s-29e in the Edison field for Macson Oil Co.

Dunlap & Graham has been named drilling contractor on L. M. Lockhart's Macrate No. 2 in Sec. 27-4n-23w in the Sulphur Mountain area, Ventura County.

Contract has been let to Pioneer Drilling Co. to redrill Allied No. 23 for Jergins Oil Co. in the Long Beach Harbor area at Broadway and Santa Clara Sts.

Santa Fe Drilling Co. is the contractor on Union Oil Co.'s Orcutt No. 8 in the Orcutt field. Santa Fe also has the contract to recondition S. P. Kraemer's Fee No. 2-1 at Richfield, and drill Standard of California's Huntington No. H-36 at Huntington Beach.

Meyers Drilling Service, a new drilling company at Bakersfield, is engaging primarily in the drilling of shallow core holes and water wells. The company is owned by Archie C. Meyers.

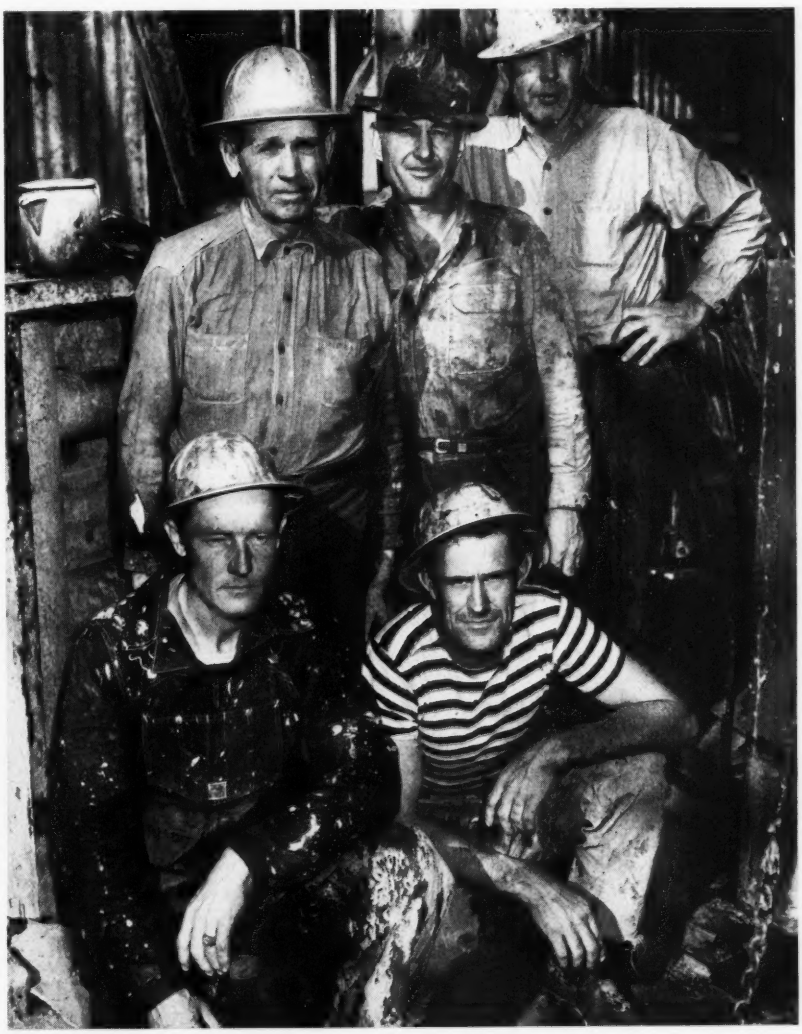
T. P. Pike Drilling Co. has brought in another well for Basin Oil Co. at Inglewood. The well, No. 5-1, was completed at 10,326 ft. The contractor is drilling No. 7-1 at 9878 ft.

Miller and York have arranged to drill a well for O.W.S. Oil Co. in Sec. 28-26s-28e in the Mount Poso field. The contractor has given the finishing touches to Barnsdall Oil's E.P.M. No. 1 in Sec. 15-28s-28e in the Sharktooth area.

Camay Drilling Co. has the contract to drill P. E. No. 36 for Standard of California in the Huntington Beach field.

Douglas Oil Co.'s Douglas No. 13 in Sec. 22-9n-33w in the Cat Canyon field is a contract job with Acme Drilling Co.

Progress is the American Way of life. The petroleum industry IS progressive.



In the Paloma Field, General Petroleum Corp.'s well, Benco 76-28, Drilling & Exploration Co., contractors. Front row, left to right: Mart Miller, lee tong; W. C. Neal, cat head. Rear row, left to right. C. R. Parsons, pipe racker; C. E. Dixon, derrick man; Bill Howard, driller.

Johnston Stainless Welding Rods

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Off-Shore Drilling Discussed at CNGA-AIME Meeting

"With present equipment it is possible to drill in water 100 feet deep, and in the near future it will be possible to drill in water 500 feet deep," R. G. Watts, Assistant Chief Engineer of Magnolia Petroleum Company, told members of the California Natural Gasoline Association and A. I. M. E. Junior Section, at a joint meeting held at the Rio Hondo Golf Club Thursday, March 4, 1948. The statement was made during his discussion of the motion picture "Off-Shore Drilling Operations in the Gulf of Mexico." The picture is a photograpic record of the construction of facilities for drilling an oil well fifteen miles off-shore from the mouth of the Atachalafaya River, in Louisiana coastal waters.

Costs during this stage of the operation were in excess of $3,000 per day, Watts stated. Some of the more expensive items were derrick barge rental at $500 per day and tug boat rentals at $350 per day. The piles supporting the drilling equipment were 115 feet long and made of 15 inch O.D., 1 inch wall, steel pipe. Shorter wooden piles supported the pipe racks, mud storage sheds, etc. The steel piles were designed to support a load of 25 tons each, the wooden piles supported a smaller load of 15 tons each. Because of the hurricanes prevalent in the area, the derrick was designed for a wind load of 125 miles per hour. During the drilling of the first well, Watts said, the drilling crews were transported to and from the well by boat. During the drilling of subsequent wells, of which there have been two, living quarters were furnished aboard a larger boat anchored at the drill-site. The presence of a high pressure salt water strata in this area has given drillers some difficulty, Watts stated, and at times has threatened to blow out.

So far, Watts stated, Magnolia has been unsuccessful in developing production, but one operator recently completed a well in the area which was good for 400 B/D of 42 gravity oil. The operator is planning to build a submarine flow line to deliver the oil to the shore, but Watts stated that he believes that the construction of underwater oil storage tanks will be the ultimate answer to this part of the problem.

Leases in this area are obtained from the State of Louisiana, and are sold in 5000 acre blocks. As an indication of the interest in the area, Watts stated that at the last lease sale, bonuses of $35 per acre were paid. Yearly rentals are one-half the bonus. Watts said that an old law states that Louisiana has sovereignty over its coastal waters as far out as a cannon can shoot. At the time the law was made, Watts stated, this was considered to be a distance of three miles, but Louisiana now considers cannon-range to mean 31.1 miles.

AIME

(Continued from Page 11)

depth. The remainder have depths of less than six feet. It is estimated that more than a million barrels of petroleum and its products are transported daily in inland waterway equipment. The largest type of river towboat has a horsepower of oevr 2,000 and pushes at least twelve 9,000-barrel barges, making a total capacity of 108,000 barrels or more for one tow. The usual permissible draft in Western river operations is in the neighborhood of 9 to 10 feet, which coupled with other local conditions is not satisfactory for the economical use of self-propelled barges.

U.O.P. Thermal Cracker For Standard of Cal.

Standard Oil Company of California has authorized Universal Oil Products Company to design a 2-coil thermal cracking unit of the latest design, with stabilizer and other auxiliaries, and a Unisol unit to extract mercaptans from the cracked gasoline.

Both units are to be installed in the Standard Bakersfield, California, refinery, as part of a program of expansion and modernization of that plant. The cracker is to be designed to process 9000 barrels per day of heavy oils.

C. F. Braun Company, of Alhambra, California are the general contractors.

Lufkin Introduces Two New Pumping Units

V. J. (Vic) Fawcett, of Lufkin Foundry & Machine Company, announces the addition of two new pumping units, making the Lufkin line more tailored to production requirements. Mr. Fawcett stated that "Lufkin has long recognized the value of intermediate refinements in the unit sizes." This enables them to provide a more tailored line than has been previously available. These units will be known as the TC-44-80D and the TC-1B-41B-84-320. The last three digits in both instances indicate gear torque capacity.

"The new TC-44-80D gear is rated at 80,000"#, 48" stroke, and has beam capacity of 14,060#. The TC-1B-41B-84-320 provides 84" stroke length and fills a need for larger capacity operations," stated Mr. Fawcett.

Mr. Fawcett pointed out that the Lufkin line is now complete to the extent of being able to provide pumping units with rated gear torques from 28,000"# through and including 850,000"#.

"Lufkin sales engineers are now in a position to counsel with production companies and are able to analyze their needs for pumping units that will give the maximum production and maximum efficiency with a unit tailored to the specific job." Mr. Fawcett pointed out, "In addition, many combinations of these units are possible which, thereby, provide the exact unit indicated in the production company's specifications." "This," according to Mr. Fawcett, "is in conjunction with Lufkin's express purpose of maintaining engineering research constantly in step with production companies' requirements."

Leschen & Sons Rope Co. Appoint New Distributor

A. Leschen & Sons Rope Company, St. Louis, Mo. have announced that effective April 1, 1948, their entire line of Oil Field Wire Ropes will be distributed in California by the new firm of Ball and Black Supply Company, whose address is 2439 Hunter Street, Los Angeles.

This firm is composed of two experienced Wire Rope men, well known throughout the territory they serve. These two men are C. R. (Chuck) Ball and C. H. (Clif) Black. Mr. Ball has been identified with the California Oil Fields for about 20 years, while Mr. Black has been active in the California Fields for 25 years, and prior to that he spent a good many years in the Mid-Continent Field.

The A. Leschen & Sons Rope Company have also announced that they have recently established a warehouse at 2439 Hunter Street, Los Angeles, where a complete stock of Oil Field ropes is being carried.

Progress is the American Way of life. The petroleum industry IS progressive.

LAUGH THIS OFF!!

An office manager was telling how a girl came in to apply for a job. When asked if she had any particular qualifications or unusual talents, she said she had won several prizes in crossword puzzles and slogan-writing contests.

"Sounds good," the manager told her, "but we want somebody who will be smart during office hours."

"Oh," said the girl, "this was during office hours."

Jackson and his wife were doing a little fly hunting about the house. "How many have you caught?" she asked after a while.

"Six," replied her husband, "three males and three females."

"How absurd!" his wife sniffed. "How could you tell if they were males or females?"

"Easy, my dear," he retorted. "Three were on the sugar and three were on the mirror."

A visiting Texan was enjoying the wonders of California as pointed out by a native.

"What beautiful grapefruit," he said as they passed a grove of citrus trees.

"Grapefruit! Why those are lemons and small ones at that, because, of the comparatively bad season," explained the Californian.

"And what are those enormous blossoms?" questioned the Texan as they moved along.

"Just a patch of dandelions," answered the guide.

Presently they reached the Sacramento river. "Ah," said the longhorn, "someone's radiator is leaking."

Three small boys were sitting on the curb. One was playing with an airplane, one was playing with a fire engine and one was reading Esquire.

A kindly old man approached and asked them what they wanted to be when they grew up.

The first replied that he wanted to pilot a B-29.

The second wanted to be a fireman.

The third looking up from his magazine, replied, "Aw, it isn't important; I just want to grow up."

A golf professional, hired by a big department store to give golf lessons, was approached by two women. "Do you wish to learn to play golf, madam?" he asked one.

"Oh no," she said, "it's my friend who wants to learn. I learned yesterday."

Johnny at Poultry Show: "Let's stay until they let the animals out."

Mother: "They don't let them out, Johnny."

Johnny: "Yes, Mother; last night Dad told Uncle Bill that they would wait after the show and pick up a couple of chickens."

"Young lady, I'd like to give you a complete physical examination."

"But Doctor Jones examined me last week and found me perfect."

"Yes, that's what he told me."

A southern farmer was introducing his family of boys to the President. "Seventeen boys," he said. "All are democrats but John, the little rascal. He got to readin'."

More Profit with a . . . . JENSEN

By using power more efficiently, reducing wear on polish rod, stuffing box and other parts and keeping service costs at a minimum, Jensen Pumping Units do cut production costs.

Naturally, if production costs are reduced, profits are increased. And that's exactly what a Jensen will do —give you more production profit.

A booklet giving details on Jensen advantages can be had by contacting your near-by dealer or writing to Coffeyville. Phone or write today.

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